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REVISED TABLE OF EARTH SATELLITES. VOLUME 2. 1969 TO 1973.(U)
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ROYAL AIRCRAFT ESTABLISHMENT

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Technical Report 79001

January 1979

REVISED TABLE OF EARTH SATELLITES, VOLUME 2: 1969 TO 1973

by

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H. Hiller, Doreen M.C. Walker

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Procurement Executive, Ministry of Defence
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SUMMARY

The RAE Table of satellites at present runs to more than 550 pages, and is divided into three volumes. Volume 1, with satellites launched in the years 1957-1968, was issued in revised form early in 1978. Volume 2, covering the years 1969-1973, was originally issued in 1974, and the present revised version incorporates more than a thousand amendments that have accumulated in the past five years. Volume 3 will cover the years 1974-1978, but so far only Parts 1-3 (1974-1976) have been issued.

The present volume lists 559 satellite launches, arranged chronologically. For each launch, the Table gives the name and international designation of each instrumented satellite and its associated rocket(s), with the date of launch, lifetime (actual or estimated), mass, shape, dimensions and at least one set of orbital parameters. Other fragments associated with a launch are listed without these details.

The main Table, which occupies 171 pages, is prefaced by six pages of introduction and explanation, and followed by a seven-page index.

Departmental Reference: Space 562

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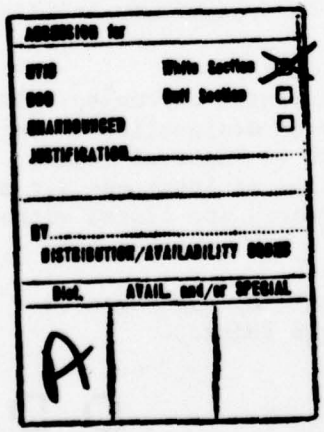

1 INTRODUCTION

A Table of artificial satellites, giving launch dates, lifetimes, weights, sizes and orbits, has been issued by the Royal Aircraft Establishment since 1958, with yearly revisions and monthly supplements. The launches are listed chronologically, with Volume 1 covering the years 1957-1968, Volume 2 the years 1969-1973, and Volume 3 the years 1974-1978. Volume 1 (originally issued in 1970) was reissued in revised form in 1978[1]. Volume 2 (originally issued[2] in 1974) now appears in the same format, updated to 1 January 1979, and incorporating more than a thousand amendments that have accumulated over the past five years. The most important changes are the insertion of decay dates for the years 1974-1978, revisions of the estimated mass and dimensions of many Russian rockets, and the identification of engines and capsules jettisoned from the recoverable Cosmos satellites. Volume 3 will be issued as soon as possible: so far only Parts 1-3 (1974-1976) have appeared.

The numbers of successful launches of satellites and space vehicles each year between 1969 and 1973 are tabulated below, with national sub-totals and the numbers of launches from which at least one component was still in orbit on 1 January 1979.

Census of satellites and space vehicles 1969-1973

Year of launch / Country of origin	1957-1968	1969	1970	1971	1972	1973	Total national launches 1957-1973	Total launches in orbit 1 Jan 1979
USSR	314	68	79	81	70	83	695	165
USA	432	33	23	25	24	21	558	249
France	4	0	1	1	0	0	6	6
Japan	-	-	1	2	1	0	4	4
China	-	-	1	1	0	0	2	2
UK	-	-	-	1	0	0	1	1
USA/Intelsat	6	3	3	2	2	1	17	17
USSR/Intercosmos	-	2	2	1	3	2	10	0
USA/ESRO	3	1	0	0	3	0	7	1
USA/Canada	2	1	0	1	1	1	6	6
USA/UK	3	1	1	1	0	0	6	2
USSR/France	-	-	-	1	1	1	3	2
USA/Italy	2	0	0	1	0	0	3	0
USA/France	1	0	0	1	0	0	2	2
USA/NATO	-	-	1	1	0	0	2	2
USA/Australia	1	0	1	0	0	0	2	1
USA/FRG	-	1	0	0	1	0	2	1
France/FRG	-	-	1	0	0	0	1	0
Total launches	768	110	114	120	106	109	1327	
Total launches still in orbit on 1 Jan 1979	242	33	40	56	46	44		461

Fig 1 below shows the number of launches each year between 1957 and 1978. The trend from 1957 to 1967 was a fairly steady increase, with the number of launches reaching 127 in 1967. Then the trend changed, and from 1968 to 1978 the yearly number of launches has remained much the same, between 106 and 128.

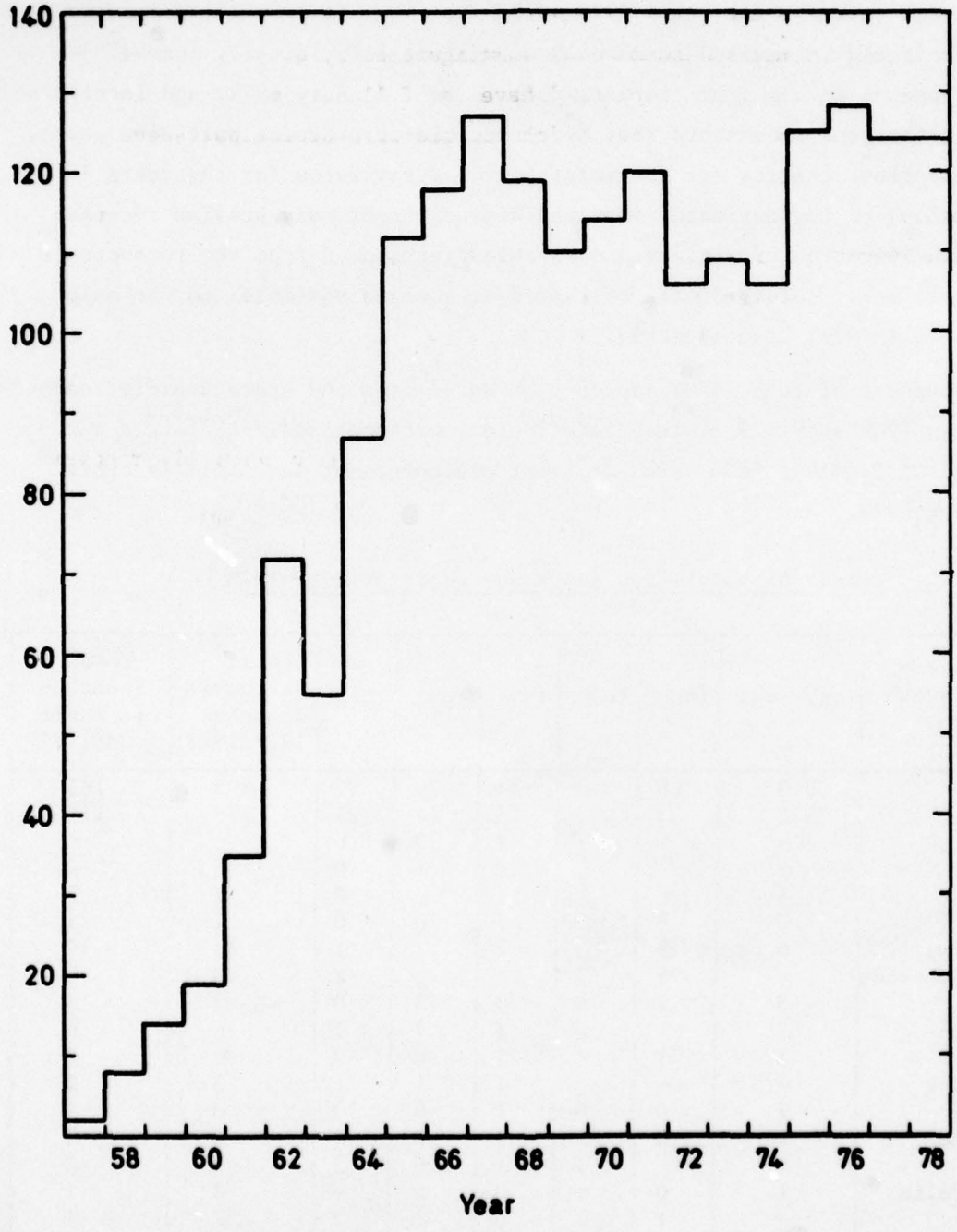

Fig 1 Yearly numbers of satellite launches, 1957 to 1978

2 GUIDE TO TABLE OF SATELLITES

The data given in the main Table, for all satellites other than fragments, are as follows.

Column 1 gives the name of the satellite and its international designation. If the name is unknown, the launching vehicle is indicated in square brackets. Doubtful entries are distinguished by question marks. Letters to the left of Column 1 have the following meanings:

B denotes unmanned satellites which carried live biological specimens.

D denotes satellites no longer in orbit on 1 January 1979. (For fragments, D indicates that all have decayed; 1d indicates that one has decayed; 2d indicates that two have decayed, and so on.)

L denotes satellites with retroreflectors for laser tracking.

M denotes manned satellites; 2M indicates a crew of two at launch; etc.

p indicates that pieces were picked up on Earth after re-entry.

R denotes satellites which returned to Earth and were recovered intact.

r denotes satellites carrying capsules which were successfully recovered.

T denotes satellites still transmitting radio signals on 1 January 1979.

Column 2 gives the launch date, lifetime (actual or estimated), and descent date (if appropriate). The dates are given in days and decimals of a day UT. Thus 1969 May 18.70 means "16h 48m UT (or GMT) on 18 May 1969".

Column 3 gives the shape of the satellite and its mass in kilograms (1 kg = 2.205 lb). Sometimes the shape defies description in a few words and the description given is only approximate.

Column 4 gives the basic dimensions of the satellite in metres. Aerials, paddles carrying solar cells, and other components projecting from the main body are not normally taken into account when giving the size and shape (1 m = 3.281 ft).

Column 5 gives the date for the orbital information in Columns 6-12.

Column 6 gives the inclination of the orbit to the equator, in degrees.

Column 7 gives the nodal period of revolution - the time interval, in minutes, between successive northward equatorial crossings by the satellite.

Columns 8-11 specify the size and shape of the orbit. The quantities tabulated are the semi major axis a ; the eccentricity e ; and the perigee and apogee heights {a(1 - e) - R} and {a(1 + e) - R} respectively, where R is the Earth's equatorial radius, 6378.1 km.
(1 km = 0.6214 statute miles = 3281 ft = 0.5396 nautical miles.)

Column 12 gives the argument of perigee - the angle, measured round the orbit, from the northward equatorial crossing to the perigee.

The names of space vehicles (which have escaped from the dominance of the Earth's gravitational field) are given below the table, on the appropriate pages. A separate Table of space vehicles is available[3,4].

The index after the main Table gives the names of the satellites in alphabetical order, with the international designation of each and the page on which details may be found. Satellites which are not Russian or American may be found in the index by referring to the appropriate country.

3 METHODS USED

3.1 Difficulties

The chief difficulty is lack of accurate information about the size, shape and weight of most of the satellites. The majority of launchings are military, and little information is released about these satellites or their final-stage rockets; we have to rely largely on deductions from their visual appearance in the night sky and on identifying previous launches of similar character. In contrast, we have full details of most international satellites and those launched by NASA.

3.2 Names and designations of satellites

The names given by the launching authorities are indicated when known. For unnamed United States Air Force satellites, the launch vehicle is given in square brackets: the lists issued by the United Nations have been useful in identifying the launch vehicles and orbits for these satellites. Some of the names are given as initials only, and the meanings of these acronyms are given as footnotes.

The international designation of each satellite launching is allocated by the World Warning Agency on behalf of COSPAR. But the identification of particular pieces in a multiple launch has often depended on visual observations, since an experienced visual observer can often recognize the species of rocket

or satellite he is looking at and distinguish between the satellite and its rocket. Small pieces which are, as far as is known, not instrumented satellites, are called fragments.

3.3 Lifetimes

The orbits of most satellites contract slowly under the action of air drag, and the severity of the drag determines their lifetimes, which can be estimated from the orbital decay rates (unless the satellites are swept up as space-rubbish, or suffer other major perturbations). The decay rate depends on air density, and the density depends critically on solar activity, which cannot be accurately predicted. So most lifetime estimates are likely to be in error by 10% or more; if solar activity in future cycles should decline to the low levels prevalent in the late 17th century, lifetimes of 20-50 years given here would be seriously underestimated.

For some of the satellites in high-eccentricity orbits, such as the Molniya satellites and rockets, the lifetimes depend primarily on lunisolar perturbations rather than air drag, and have been estimated by numerical integration of these perturbations, as described in Ref 5.

3.4 Weights and dimensions

The weights and dimensions of the satellites come from Spacewarn launch telegrams, NASA Press Releases, and press and radio reports. Some indication of the accuracy is given by the number of significant figures. Often it is difficult to define the 'length' or 'diameter' when components of irregular size and shape are joined together, and dimensions are therefore sometimes approximate.

For satellites of unknown mass and size, the average cross-sectional area S can be approximately determined from the average brightness when observed visually; the mass/area ratio m/S can be obtained from the rate of change of orbital period and the known air density at heights near perigee, to give a value for the mass m. Many of our values for the dimensions of Russian rockets are based on the detailed studies by Sheldon[6].

We hope that most of the weights and dimensions given with question marks are accurate to within a factor of 1.5, *ie* that the real values are between 2/3 and 3/2 times the value given. It seemed better to give some indication of the weights and sizes, even if approximate, rather than to leave blanks.

3.5 Orbital accuracy

Orbital information has come from many sources. Most of the orbits are based on the elements issued by the United States Air Force, and the remainder come mainly from NASA and RAE orbits.

The accuracy of the orbits varies greatly between one satellite and another, and no detailed guide can be given. Most orbits, however, are believed to have an error (sd) of about 0.02^{o} in orbital inclination, 0.02 min in period, 2 km in semi major axis, 5 km in perigee and apogee heights (when the apogee height is less than 2000 km), 0.001 in eccentricity e , and perhaps 3^{o} in argument of perigee (if $e > 0.02$). Some orbits are much more accurate than this, and some, particularly those with eccentricity exceeding 0.3 or with very short lifetimes, may be much less accurate.

4 RADIO TRANSMISSIONS

The majority of satellites launched before 1972 are now silent, but a few are still transmitting. It is estimated that the average active life for radio transmission is about two years for Soviet satellites and seven years for US satellites. The most complete list of radio frequencies of satellites is in *Telecommunication Journal*, Vol 44, No.2 (1977).

Acknowledgments

We are indebted to the various sources mentioned in the text for information about the satellites, and most of all to the North American Air Defense Command for having issued comprehensive orbital information for so many years. We thank G.E. Perry for providing the descent times of recoverable Cosmos satellites.

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4	J.A. Pilkington	Table of space vehicles: 1973-1977. RAE Technical Memorandum Space 256 (1978)
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REVISED TABLE OF EARTH SATELLITES

Year of launch 1969

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Venus 5 launcher rocket	1969-01B	1969 Jan 5.27 1.56 days 1969 Jan 6.83	Cylinder 2500?	7.5 long 2.6 dia	1969 Jan 5.3	51.82	88.65	6589	203	218	0.001	106
D	Venus 5 launcher	1969-01C	1969 Jan 5.27 1.96 days 1969 Jan 7.23	Irregular	-	1969 Jan 5.5	51.80	88.55	6584	186	225	0.003	133
D	Venus 6 launcher rocket	1969-02B	1969 Jan 10.24 0.9 day 1969 Jan 11.14	Cylinder 2500?	7.5 long 2.6 dia	1969 Jan 10.5	51.75	88.20	6567	184	193	0.001	297
D	Venus 6 launcher	1969-02C	1969 Jan 10.24 3.07 days 1969 Jan 13.31	Irregular	-	1969 Jan 11.3	51.66	88.51	6582	201	207	0.0005	118
D R	Cosmos 263	1969-03A	1969 Jan 12.51 7.72 days 1969 Jan 20.23	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Jan 13.8	65.43	89.74	6641	200	325	0.009	54
D	Cosmos 263 rocket	1969-03B	1969 Jan 12.51 5.49 days 1969 Jan 18.00	Cylinder 2500?	7.5 long 2.6 dia	1969 Jan 14.4	65.34	89.40	6624	174	317	0.011	43
D	Fragment	1969-03C											
D 1M R	Soyuz 4*	1969-04A	1969 Jan 14.32 2.95 days 1969 Jan 17.27	Sphere-cylinder + 2 wings 6625	7.5 long 2.2 dia	1969 Jan 14.5 1969 Jan 15.2	51.73 51.73	88.20 88.72	6566 6592	161 205	215 223	0.004 0.001	293 20
D	Soyuz 4 rocket	1969-04B	1969 Jan 14.32 0.78 day 1969 Jan 15.10	Cylinder 2500?	7.5 long 2.6 dia	1969 Jan 14.5	51.70	88.03	6558	147	212	0.005	276

Space Vehicles: Venus 5, 1969-01A; Venus 6, 1969-02A.

* Two crew members from Soyuz 5 transferred to Soyuz 4 during docking from Jan 16.35 to Jan 16.54 (See page 186.)

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D 3R	Soyuz 5	1969-05A	1969 Jan 15.30 3.03 days 1969 Jan 18.33	Sphere-cylinder + 2 wings 6585	7.5 long 2.2 dia	1969 Jan 15.7	51.69	88.87	6600	210	233	0.002	66
D	Soyuz 5 rocket	1969-05B	1969 Jan 15.30 2.08 days 1969 Jan 17.38	Cylinder 2500?	7.5 long 2.6 dia	1969 Jan 15.5	51.69	88.50	6581	194	212	0.001	1
D	Fragment	1969-05C											
	OSO 5 *	1969-06A	1969 Jan 22.70 20 years	Nonagonal box + vane 291	0.94 long 1.12 dia	1969 Jan 22.9	32.95	95.48	6927	536	561	0.002	241
	OSO 5 rocket	1969-06B	1969 Jan 22.70 12 years	Cylinder 24	1.50 long 0.46 dia	1969 Feb 10.4 1972 Sep 1.0	32.99 32.99	95.51 94.72	6928 6889	538 502	562 520	0.002 0.001	65 -
D	[Titan 3B Agena D]	1969-07A	1969 Jan 22.80 12 days 1969 Feb 3	Cylinder 3000?	8 long? 1.5 dia	1969 Jan 23.2 1969 Jan 30.3	106.15 106.12	97.04 96.78	6994 6981	142 140	1090 1066	0.068 0.066	154 151
D	Fragment	1969-07B											
D R	Cosmos 264 **	1969-08A	1969 Jan 23.39 12.88 days 1969 Feb 5.27	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1969 Jan 24.7 1969 Jan 29.7	69.94 69.92	89.57 89.73	6630 6639	209 213	295 308	0.006 0.007	47 53
D	Cosmos 264 rocket	1969-08B	1969 Jan 23.39 7.53 days 1969 Jan 30.92	Cylinder 2500?	7.5 long 2.6 dia	1969 Jan 25.2	69.94	89.41	6623	207	282	0.006	39
D	Cosmos 264 engine †	1969-08C	1969 Jan 23.39 21.48 days 1969 Feb 13.87	Cone 600? full	1.5 long? 2 dia?	1969 Feb 5.2	69.92	89.61	6633	207	303	0.007	33

* Orbiting Solar Observatory.

** Carried supplementary extragalactic gamma-ray experiment.

† 1969-08C ejected from 08A about Feb 4.4.

Year of launch 1969 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Isis 1*	1969-09A	1969 Jan 30.28 250 years	Polyhedron 241	1.07 long 1.27 dia	1969 Feb 4.2	88.42	128.42	8430	578	3526	0.175	161
	Isis 1 rocket	1969-09B	1969 Jan 30.28 150 years	Cylinder 24	1.50 long 0.46 dia	1969 Feb 1.7	88.42	128.30	8425	579	3515	0.174	165
D	[Thorad Agena D]**	1969-10A	1969 Feb 5.92 18.86 days 1969 Feb 24.78	Cylinder 2000?	8 long? 1.5 dia	1969 Feb 6.1	81.54	88.70	6587	178	239	0.005	161
	Capsule	1969-10B	1969 Feb 5.92 10000 years	Octagon? 60?	0.3 long? 0.9 dia?	1969 Feb 6.7	80.41	114.22	7796	1396	1441	0.003	39
	Fragment	1969-10C											
	Intelsat 3C (F-3)†	1969-11A	1969 Feb 6.03 >million years	Cylinder 293 full 137 empty	1.04 long 1.42 dia	1969 Mar 17.0	1.34	1436.4	42173	35782	35808	0.0003	74
	Intelsat 3C rocket	1969-11B	1969 Feb 6.03 20 years	Cylinder 24	1.50 long 0.46 dia	1972 May 1.0	29.5	613.9	23926	343	34753	0.719	-
D	Cosmos 265	1969-12A	1969 Feb 7.59 82.50 days 1969 May 1.09	Ellipsoid 400?	1.8 long 1.2 dia	1969 Feb 9.2	71.01	91.89	6745	275	458	0.014	71
D	Cosmos 265 rocket	1969-12B	1969 Feb 7.59 38.20 days 1969 Mar 17.79	Cylinder 1500?	8 long 1.65 dia	1969 Feb 9.2	71.01	91.67	6734	274	437	0.012	76

* International satellite for ionospheric studies (Canada).

† International telecommunications satellite.

** Thorad: long-tank thrust-augmented Thor.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Tactical Comsat 1	1969-13A	1969 Feb 9.88 > million years	Cylinder +5 aerials 730	6.1 long 2.4 dia	1969 Apr 16.0	0.8	1436.0	42164	35768	35803	0.0004	-
	Tacsat 1 rocket [Titan 3C]	1969-13B	1969 Feb 9.88 > million years	Cylinder 1500?	6 long? 3.0 dia	1969 Feb 10	0.65	1446.5	42370	35940	36044	0.001	159
D R	Cosmos 266	1969-15A	1969 Feb 25.43 7.9 days 1969 Mar 5.3	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Feb 27.1	72.90	89.90	6647	202	336	0.010	48
D	Cosmos 266 rocket	1969-15B	1969 Feb 25.43 7.33 days 1969 Mar 4.76	Cylinder 2500?	7.5 long 2.6 dia	1969 Feb 27.2	72.89	89.62	6633	198	312	0.009	43
D	Fragment	1969-15C											
	Essa 9 *	1969-16A	1969 Feb 26.32 10000 years	Cylinder 145	0.56 long 1.07 dia	1969 Mar 3.4	101.79	115.28	7846	1427	1508	0.005	119
	Essa 9 rocket	1969-16B	1969 Feb 26.32 5000 years	Cylinder 24	1.50 long 0.46 dia	1969 Mar 1.3	101.79	115.21	7842	1423	1505	0.005	120
D R	Cosmos 267	1969-17A	1969 Feb 26.35 7.93 days 1969 Mar 6.28	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Feb 27.2	65.04	89.82	6645	205	329	0.009	50
D	Cosmos 267 rocket	1969-17B	1969 Feb 26.35 7.12 days 1969 Mar 5.47	Cylinder 2500?	7.5 long 2.6 dia	1969 Feb 27.2	64.99	89.63	6636	204	311	0.008	45

Space Vehicles: Mariner 6, 1969-14A; and Centaur rocket, 1969-14B.

* Environmental Science Services Administration.

Year of launch 1969 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D 3M R	Apollo 9 (CM + SM)	1969-18A	1969 Mar 3.67 10.04 days 1969 Mar 13.71	Cone-cylinder 22030 full 11205 empty	10.36 long 3.91 dia	1969 Mar 4.5 1969 Mar 4.9 1969 Mar 9.5	32.57 33.84 33.63	88.64 91.46 88.49	6594 6733 6587	203 198 194	229 511 223	0.002 0.023 0.002	67 70 94
	Saturn IV B [Saturn 504]	1969-18B	1969 Mar 3.67 Indefinite	Cylinder 13400	18.7 long 6.6 dia	1969 Mar 3.7 1969 Mar 3.9	32.57 32.57	88.15 118.6	6569 7999	191 191	191 3050	0 0.179	- -
						Entered heliocentric orbit 1969 Mar 3.92							
	LEM 3* Ascent stage	1969-18C	1969 Mar 3.67 12 years	Box + 2 tanks 4450 full 2300 empty	2.52 high 3.76 wide 3.13 deep	1969 Mar 8.6 1971 Feb 1.0 1974 Mar 1.0	28.91 28.91 28.90	164.70 154.61 142.2	9959 9546 9024	227 234 225	6935 6102 5067	0.337 0.307 0.268	130 - -
D	LEM 3 Descent stage	1969-18D	1969 Mar 3.67 18.49 days 1969 Mar 22.16	Octagon + cone + legs 10075 full 1935 empty	1.57 high 3.13 wide	1969 Mar 9.4	33.63	89.25	6622	242	246	0.0004	256
D	[Titan 3B Agena D]	1969-19A	1969 Mar 4.81 14 days 1969 Mar 18	Cylinder 3000?	8 long? 1.5 dia	1969 Mar 5.2	92.00	90.50	6676	134	461	0.024	147
D	Cosmos 268	1969-20A	1969 Mar 5.55 429.78 days 1970 May 9.33	Ellipsoid 400?	1.8 long 1.2 dia	1969 Mar 5.9 1969 Jul 16.3 1969 Dec 16.3	48.40 48.37 48.3	109.14 105.08 100.29	7569 7380 7153	209 209 202	2173 1795 1348	0.130 0.107 0.080	102 - -
D	Cosmos 268 rocket	1969-20B	1969 Mar 5.55 342.52 days 1970 Feb 11.07	Cylinder 1500?	8 long 1.65 dia	1969 Mar 7.3 1969 Jun 16.0 1969 Oct 16.3	48.40 48.3 48.3	109.12 104.87 100.60	7568 7370 7169	221 219 212	2159 1764 1369	0.128 0.105 0.081	107 - -

* LEM attached to Apollo 9, separated from Saturn IV B on Mar 3.84. LEM is Lunar Excursion Module.
LEM with two crew members separated from Apollo 9 on Mar 7.53.
LEM ascent stage separated from descent stage on Mar 7.71; briefly re-docked with Apollo 9 on Mar 7.79.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 269	1969-21A	1969 Mar 5.73 3517 days 1978 Oct 21	Cylinder + paddles? 900?	2 long? 1 dia?	1969 Mar 9.5 1971 Dec 1.0	74.05 74.05	95.34 94.47	6912 6870	525 487	543 497	0.001 0.001	340 -
D	Cosmos 269 rocket	1969-21B	1969 Mar 5.73 3424 days 1978 Jul 20	Cylinder 2200?	7.4 long 2.4 dia	1969 Mar 9.5 1972 Jan 1.0	74.17 74.17	95.52 94.63	6922 6878	540 498	547 502	0.0005 0.0003	263 -
20d	Fragments	1969-21C-Y											
D R	Cosmos 270	1969-22A	1969 Mar 6.51 7.74 days 1969 Mar 14.25	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Mar 9.1	65.43	89.81	6644	200	331	0.010	53
D	Cosmos 270 rocket	1969-22B	1969 Mar 6.51 5.94 days 1969 Mar 12.45	Cylinder 2500?	7.5 long 2.6 dia	1969 Mar 9.4	65.41	89.22	6615	185	288	0.008	39
D R	Cosmos 271	1969-23A	1969 Mar 15.51 7.78 days 1969 Mar 23.29	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Mar 16.2	65.40	89.71	6638	196	324	0.010	47
D	Cosmos 271 rocket	1969-23B	1969 Mar 15.51 6.58 days 1969 Mar 22.09	Cylinder 2500?	7.5 long 2.6 dia	1969 Mar 19.2	65.40	88.71	6588	168	252	0.006	38
	Cosmos 272	1969-24A	1969 Mar 17.70 3000 years	Spheroid + paddles? 650?	1.6 dia?	1969 Mar 19.1	73.99	109.35	7574	1181	1211	0.002	260
	Cosmos 272 rocket	1969-24B	1969 Mar 17.70 2000 years	Cylinder 2200?	7.4 long 2.4 dia	1969 Mar 21.2	73.98	109.25	7569	1178	1203	0.002	231
	Fragment	1969-24C											

Year of launch 1969, continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	OV1-17*	1969-25A	1969 Mar 18.32 352.23 days 1970 Mar 5.55	Cylinder + 2 hemispheres 142	1.40 long 0.69 dia	1969 Mar 28.7 1969 Jul 16.3 1969 Nov 16.0	99.18 99.1 99.1	93.21 92.59 91.83	6808 6778 6741	397 374 346	463 425 379	0.005 0.004 0.002	342 - -
D	OV1-18	1969-25B	1969 Mar 18.32 1258.68 days 1972 Aug 28.00	Cylinder + 2 hemispheres 125	1.40 long 0.69 dia	1969 Mar 20.9 1970 May 1.0 1971 Nov 1.0	98.86 98.86 98.86	95.15 94.35 92.92	6903 6864 6794	466 443 395	583 528 436	0.008 0.006 0.003	157 - -
	OV1-19	1969-25C	1969 Mar 18.32 300 years	Cylinder + 2 hemispheres 124	1.40 long 0.69 dia	1969 Mar 20.8	104.77	153.44	9493	466	5764	0.279	175
D	OV1-17A (Orbiscal 2)**	1969-25D	1969 Mar 18.32 6.23 days 1969 Mar 24.55	Cylinder 221	2.05 long 0.72 dia	1969 Mar 18.9	99.10	89.37	6620	175	309	0.010	152
	OV1-19 rocket	1969-25E	1969 Mar 18.32 150 years	Cylinder 70?	2.05 long 0.72 dia	1969 Mar 28.2	104.78	153.43	9493	463	5767	0.279	168
	OV1-18 rocket	1969-25F	1969 Mar 18.32 10 years	Cylinder 70?	2.05 long 0.72 dia	1969 Mar 23.3 1972 Jan 16.5	98.85 98.85	95.15 94.35	6903 6864	465 441	584 530	0.009 0.006	149 -
D	Fragment	1969-25G											

* Orbiting Vehicle.

** Orbiting radio beacon ionospheric satellite - calibration.

Year of launch 1969, continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	[Thorad Agena D]	1969-26A	1969 Mar 19.90 4.35 days 1969 Mar 24.25	Cylinder 2000?	8 long? 1.5 dia	1969 Mar 21.7	83.04	88.73	6588	179	241	0.005	137
D	Capsule*	1969-26B	1969 Mar 19.90 991.68 days 1971 Dec 6.58	Octagon? 60?	0.3 long? 0.9 dia?	1969 Mar 26.2 1970 Oct 31.7 1971 Jun 1.0	83.08 83.0 83.0	94.82 93.34 92.19	6886 6815 6758	504 436 378	513 438 382	0.0006 0.0001 0.0003	25 - -
D R	Cosmos 273	1969-27A	1969 Mar 22.51 7.73 days 1969 Mar 30.24	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Mar 26.4	65.43	89.78	6642	198	329	0.010	52
D	Cosmos 273 rocket	1969-27B	1969 Mar 22.51 6.40 days 1969 Mar 28.91	Cylinder 2500?	7.5 long 2.6 dia	1969 Mar 26.2	65.43	89.06	6606	188	267	0.006	68
D R	Cosmos 274**	1969-28A	1969 Mar 24.42 7.90 days 1969 Apr 1.32	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Mar 26.2	64.98	89.56	6631	206	300	0.007	49
D	Cosmos 274 rocket	1969-28B	1969 Mar 24.42 5.26 days 1969 Mar 29.68	Cylinder 2500?	7.5 long 2.6 dia	1969 Mar 26.0	65.00	89.26	6616	206	270	0.005	54
	Meteor 1	1969-29A	1969 Mar 26.52 60 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1969 Mar 30.0	81.20	97.96	7038	633	687	0.004	80
	Meteor 1 rocket	1969-29B	1969 Mar 26.52 60 years	Cylinder 1440	3.8 long 2.6 dia	1969 Mar 31.1	81.21	98.14	7046	466	870	0.029	175
29d	Fragments	1969-29C-AP											

Space Vehicles: Mariner 7, 1969-30A; and Centaur rocket 1969-30B.

*1969-26B ejected from 1969-26A about Mar 19.97.

** Carried supplementary atmospheric-composition experiment.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 275	1969-31A	1969 Mar 28.67 315.61 days 1970 Feb 7.28	Ellipsoid 400?	1.8 long 1.2 dia	1969 Mar 30.0 1969 Sep 16.0	70.98 70.9	95.18 93.42	6905 6821	273 261	780 624	0.037 0.027	80 -
D	Cosmos 275 rocket	1969-31B	1969 Mar 28.67 171.76 days 1969 Sept 16.43	Cylinder 1500?	8 long 1.65 dia	1969 Mar 29.7 1969 Jun 16.0	70.96 70.9	95.07 93.30	6899 6815	274 260	768 613	0.036 0.026	82 -
D R	Cosmos 276	1969-32A	1969 Apr 4.43 6.90 days 1969 Apr 11.33	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Apr 6.2	81.36	90.25	6664	200	371	0.013	79
D	Cosmos 276 rocket	1969-32B	1969 Apr 4.43 10.07 days 1969 Apr 14.50	Cylinder 2500?	7.5 long 2.6 dia	1969 Apr 7.1	81.35	89.94	6648	203	337	0.010	73
D	Cosmos 277	1969-33A	1969 Apr 4.54 92.57 days 1969 Jul 6.11	Ellipsoid 400?	1.8 long 1.2 dia	1969 Apr 6.2	70.95	91.90	6745	268	466	0.015	87
D	Cosmos 277 rocket	1969-33B	1969 Apr 4.54 43.68 days 1969 May 18.22	Cylinder 1500?	8 long 1.65 dia	1969 Apr 6.8	70.94	91.77	6739	266	455	0.014	86
D R	Cosmos 278	1969-34A	1969 Apr 9.54 7.78 days 1969 Apr 17.32	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Apr 14.8	65.42	89.58	6632	198	310	0.008	44
D	Cosmos 278 rocket	1969-34B	1969 Apr 9.54 7 days 1969 Apr 16	Cylinder 2500?	7.5 long 2.6 dia	1969 Apr 10.2	65.40	89.49	6628	190	309	0.009	36

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Molniya IL	1969-35A	1969 Apr 11.11 1832 days 1974 Apr 17	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1969 Apr 22.1 1970 May 1.0 1971 May 16.5	64.94 65.07 65.15	713.50 717.67 717.44	26451 26554 26548	404 1060 1368	39741 39291 38972	0.744 0.720 0.708	285 - -
D	Molniya IL launcher rocket	1969-35B	1969 Apr 11.11 20.09 days 1969 May 1.20	Cylinder 2500?	7.5 long 2.6 dia	1969 Apr 12.8	65.02	90.94	6699	234	408	0.013	60
D	Molniya IL rocket	1969-35C	1969 Apr 11.11 1907.00 days 1974 Jul 1.11	Cylinder 440	2.0 long 2.0 dia	1969 Apr 24.5 1970 May 1.0 1971 Jun 1.0	64.98 65.07 65.1	710.28 710.28 710.24	26371 26371 26370	461 1037 1350	39524 39848 38633	0.741 0.719 0.707	285 - -
D	Molniya IL launcher	1969-35D	1969 Apr 11.11 24.03 days 1969 May 5.14	Irregular	-	1969 Apr 13.4	65.00	91.36	6720	222	461	0.018	65
	SMEWS 2† [Atlas Agena D]*	1969-36A	1969 Apr 13.10 > million years	Cylinder 700 full? 350 empty?	1.7 long? 1.4 dia?	1969 Apr 14	9.9?	1445	42350	32670	39270	0.078	-
	Nimbus 3	1969-37A	1969 Apr 14.33 800 years	Conical skeleton + 2 paddles 575	3.00 long 1.45 dia	1969 Apr 25.5	99.91	107.40	7483	1075	1135	0.004	215
	Secor 13** (EGRS 13)††	1969-37B	1969 Apr 14.33 2000 years	Rectangular box 20	0.33 x 0.28 x 0.23	1969 Apr 15.4	99.93	107.36	7481	1075	1130	0.004	230
	Nimbus 3 rocket	1969-37C	1969 Apr 14.33 1000 years	Cylinder 700?	6 long? 1.5 dia	1969 Apr 16.0	99.92	107.50	7488	1078	1141	0.004	-

* The Agena D rocket (1969-36B) is probably in an eccentric orbit like that of 1970-46B.

** Secor is Sequential collation of range.

† Ballistic Missile Early Warning Satellite.

†† Electronic Geodetic Ranging System.

Year of launch 1969, continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 279†	1969-38A	1969 Apr 15.35	Sphere-cylinder	5 long?	1969 Apr 18.4	51.74	89.04	6608	192	267	0.006	25
R			7.98 days	5530?	2.4 dia								
			1969 Apr 23.33										
D	Cosmos 279 rocket	1969-38B	1969 Apr 15.35	Cylinder	7.5 long	1969 Apr 16.7	51.74	88.65	6589	169	253	0.006	9
			2.76 days	2500?	2.6 dia								
			1969 Apr 18.11										
D	[Titan 3B	1969-39A	1969 Apr 15.73	Cylinder	8 long?	1969 Apr 20.1	108.76	89.96	6651	135	410	0.021	127
R	Agena D]		15 days	3000?	1.5 dia	1969 Apr 30.5	108.76	89.03	6605	130?	323?	0.015?	104
			1969 Apr 30										
D	Cosmos 280††	1969-40A	1969 Apr 23.42	Sphere-cylinder	6.5 long?	1969 Apr 25.1	51.60	89.02	6607	207	250	0.003	30
R			12.86 days	6300?	2.4 dia	1969 Apr 28.7	51.60	89.50	6631	198	307	0.008	60
			1969 May 6.28										
D	Cosmos 280 rocket	1969-40B	1969 Apr 23.42	Cylinder	7.5 long	1969 Apr 24.5	51.60	88.83	6598	196	243	0.003	38
			3.38 days	2500?	2.6 dia								
			1969 Apr 26.80										
D	Cosmos 280 engine*	1969-40C	1969 Apr 23.42	Cone	1.5 long?	1969 May 5	51.58	89.06	6610	205	258	0.004	-
			14.76 days	600? full	2 dia?								
			1969 May 8.18										
D	Fragment	1969-40D											
D	[Thorad Agena D]	1969-41A	1969 May 2.08	Cylinder	8 long?	1969 May 2.2	64.97	89.54	6631	179	326	0.011	98
			21.35 days	2000?	1.5 dia								
			1969 May 23.43										
D	Capsule**	1969-41B	1969 May 2.08	Octagon?	0.3 long?	1969 May 2.3	65.71	93.37	6815	401	473	0.005	39
			290.78 days	60?	0.9 dia?	1969 Aug 16.3	65.71	92.96	6796	393	442	0.004	-
			1970 Feb 16.86			1969 Nov 16.0	65.71	92.28	6763	361	408	0.003	-
D	Fragment	1969-41C											

* 1969-40C was ejected from 1969-40A about May 5 (approximate orbit).
** 1969-41B was ejected from 1969-41A about May 2.15.

† Carried supplementary ion orientation system.
†† Carried supplementary charged-particles experiment.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 281	1969-42A	1969 May 13.39 7.74 days 1969 May 21.13	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 May 14.1	65.42	89.43	6625	191	303	0.008	33
D	Cosmos 281 rocket	1969-42B	1969 May 13.39 3.65 days 1969 May 17.04	Cylinder 2500?	7.5 long 2.6 dia	1969 May 14.1	65.40	89.28	6617	181	297	0.009	23
D	Apollo 10**	1969-43A	1969 May 18.70 8.00 days 1969 May 26.70	Cone-cylinder 28870 full 12460 empty	11.15 long 3.91 dia	1969 May 18.7 1969 May 18.9	32.56 33.2	88.03 2400	6562 273000	183 174	184 533000	0 0.976	107 30*
R						In selenocentric orbit 1969 May 21.87 - May 24.42							
SM	Saturn IVB [Saturn 505]	1969-43B	1969 May 18.70 Indefinite	Cylinder 13600	18.7 long 6.6 dia	1969 May 18.7	32.56	88.03	6562	183	184	0	107
						Entered heliocentric orbit 1969 May 18.89							
	LEM 4 †	1969-43C	1969 May 18.70 Indefinite	Box + Octa-gon + legs 13993 full	4.1 high 3.76 wide 3.13 deep	1969 May 18.9	33.2	2400	273000	174	533000	0.976	30*
						Entered selenocentric orbit 1969 May 21.87							
D R	Cosmos 282	1969-44A	1969 May 20.36 7.7 days 1969 May 28.1	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 May 21.8	65.40	89.73	6640	202	321	0.009	52
D	Cosmos 282 rocket	1969-44B	1969 May 20.36 8.32 days 1969 May 28.68	Cylinder 2500?	7.5 long 2.6 dia	1969 May 22.5	65.40	89.45	6626	206	290	0.006	41
	Intelsat 3D (F-4)	1969-45A	1969 May 22.08 > million years	Cylinder 293 full 137 empty	1.04 long 1.42 dia	1969 Jun 1.0 1969 Jul 1.0 1977 May 13.0	0.5 0.5 6.09	1418.9 1436.5 1636.33	41827 42172 45998	35226 35787 39487	35671 35801 39753	0.005 0.0002 0.003	- - 199
D	Intelsat 3D rocket	1969-45B	1969 May 22.08 2846 days 1977 Mar ?	Cylinder 24	1.50 long 0.46 dia	1972 May 1.0	28.5	640.9	24623	396	36093	0.725	-

* Approximate orbits. ** Apollo attached to LEM, separated from Saturn IVB on May 18.89.

† LEM with 2 crew members, separated from Apollo on May 22.80. LEM ascent stage jettisoned descent stage May 22.98; re-joined Apollo May 23.13; now in solar orbit.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	OV5-5 (ERS 29)*	1969-46A	1969 May 23.33 million years	Octahedron 11	0.31 side	1969 May 24.3	33.03	3120.3	70736	17069	111647	0.668	184
	OV5-6 (ERS 26)	1969-46B	1969 May 23.33 million years	Tetrahedron 10	0.28 side	1969 May 24.3	32.86	3115.2	70658	16923	111636	0.670	184
	OV5-9	1969-46C	1969 May 23.33 million years	Modified Tetrahedron 13	0.28 side	1969 May 24.3	32.7	3115.4	70661	17046	111519	0.668	184
	Vela 9	1969-46D	1969 May 23.33 > million years	Icosahedron 259	1.27 dia	1969 May 24.5	32.8	6703	117933	110900	112210	0.006	-
	Vela 10	1969-46E	1969 May 23.33 > million years	Icosahedron 259	1.27 dia	1969 May 25.5	32.8	6709	117980	110920	112283	0.006	-
	Vela 9 rocket [Titan 3C]	1969-46F	1969 May 23.33 > million years	Cylinder 1500?	6 long? 3.0 dia	Orbit similar to 1969-46A							
D	Cosmos 283	1969-47A	1969 May 27.54 197.25 days 1969 Dec 10.79	Ellipsoid 400?	1.8 long 1.2 dia	1969 May 31.0 1969 Aug 31.7	81.94 81.9	101.95 98.48	7228 7065	199 195	1501 1178	0.090 0.070	64 -
D	Cosmos 283 rocket	1969-47B	1969 May 27.54 126.48 days 1969 Oct 1.02	Cylinder 1500?	8 long 1.65 dia	1969 May 30.5 1969 Aug 1.0	81.94 81.9	101.80 98.35	7221 7058	199 199	1486 1161	0.089 0.068	66 -

* Environment Research Satellite.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 284	1969-48A	1969 May 29.29 7.95 days 1969 Jun 6.24	Sphere-cylinder 553?	5 long? 2.4 dia	1969 May 31.5	51.76	89.45	6628	205	294	0.007	46
D	Cosmos 284 rocket	1969-48B	1969 May 29.29 6.02 days 1969 Jun 4.31	Cylinder 250?	7.5 long 2.6 dia	1969 May 30.5	51.75	89.28	6620	197	286	0.007	30
D	Fragment	1969-48C											
D	Cosmos 285	1969-49A	1969 Jun 3.54 126.09 days 1969 Oct 7.63	Ellipsoid 400?	1.8 long 1.2 dia	1969 Jun 4.8 1969 Aug 16.3	71.03 70.98	92.16 91.11	6758 6707	267 249	493 409	0.017 0.012	85 -
D	Cosmos 285 rocket	1969-49B	1969 Jun 3.54 62.89 days 1969 Aug 5.43	Cylinder 150?	8 long 1.65 dia	1969 Jun 3.9	71.03	92.06	6753	266	484	0.016	95
D R	[Titan 3B Agena D]	1969-50A	1969 Jun 3.70 11.2 days 1969 Jun 14.9	Cylinder 300?	8 long? 1.5 dia	1969 Jun 4.1	110.00	90.04	6654	137	414	0.021	131
	OGO 6*	1969-51A	1969 Jun 5.61 10 years	Box + booms 620	1.73 long 0.84 high 0.84 wide	1969 Jun 17.2 1971 Nov 1.0	82.00 82.00	99.71 98.46	7121 7062	397 391	1089 977	0.049 0.042	123 -
	OGO 6 rocket	1969-51B	1969 Jun 5.61 11 years	Cylinder 700?	6.5 long 1.5 dia	1969 Jun 17.2 1972 Feb 1.0	82.00 82.00	99.66 98.43	7118 7061	396 402	1084 963	0.049 0.040	118 -
D R	Cosmos 286	1969-52A	1969 Jun 15.38 7.78 days 1969 Jun 23.16	Sphere-cylinder 553?	5 long? 2.4 dia	1969 Jun 17.0	65.41	89.78	6642	200	327	0.010	51
D	Cosmos 286 rocket	1969-52B	1969 Jun 15.38 7.95 days 1969 Jun 23.3	Cylinder 250?	7.5 long 2.6 dia	1969 Jun 17.2	65.40	89.43	6625	188	305	0.009	40

* Orbiting Geophysical Observatory.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Explorer 41 (Imp 7)*	1969-53A	1969 Jun 21.37 1281 days 1972 Dec 23	Octagon + 4 vanes. 79	0.25 long 0.71 dia	1969 Jun 21.9 1970 Feb 15.3 1971 Jun 16.0	86.78 86.65 85.06	4843.5 4836.9 4840.9	94784 94743 94794	378 2083 3920	176,434 174,646 172,912	0.929 0.911 0.891	200 - -
D	Explorer 41 rocket	1969-53B	1969 Jun 21.37 months? 1972 Dec ?	Cylinder 24	1.57 long 0.50 dia	Orbit similar to 1969-53A							
D R	Cosmos 287	1969-54A	1969 Jun 24.29 7.96 days 1969 Jul 2.25	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Jun 25.1	51.77	88.95	6604	188	264	0.006	3
D	Cosmos 287 rocket	1969-54B	1969 Jun 24.29 2.83 days 1969 Jun 27.12	Cylinder 2500?	7.5 long 2.6 dia	1969 Jun 25.3	51.76	88.62	6588	171	249	0.006	351
D R	Cosmos 288	1969-55A	1969 Jun 27.30 7.98 days 1969 Jul 5.28	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Jun 28.0	51.76	89.17	6614	199	273	0.006	24
D	Cosmos 288 rocket	1969-55B	1969 Jun 27.30 5.29 days 1969 Jul 2.59	Cylinder 2500?	7.5 long 2.6 dia	1969 Jun 28.9	51.75	88.94	6604	193	258	0.005	29
D B R	Bios 3 capsule**	1969-56D	1969 Jun 29.14 8.85 days 1969 Jul 7.99	Blunt cone 259	1.2 long 1.02 dia	1969 Jul 1.1	33.56	91.86	6750	356	388	0.002	244
D	Bios 3 adapter	1969-56A	1969 Jun 29.14 205.43 days 1970 Jan 20.57	Cone-cylinder 440	1.8 long 1.45 dia	1969 Jul 1.1 1969 Oct 16.3	33.56 33.5	91.86 91.29	6750 6723	356 333	388 357	0.002 0.002	244 -
D	Bios 3 rocket	1969-56B	1969 Jun 29.14 155.82 days 1969 Dec 1.96	Cylinder 350?	4.9 long 1.43 dia	1969 Jul 1.8 1969 Sep 16.0	33.56 33.5	91.74 91.25	6745 6721	351 334	382 352	0.002 0.001	260 -
D	Fragment	1969-56C											

* Interplanetary monitoring platform.

** Before 1969 Jul 7.99, Bios capsule, which carried a monkey, was attached to Bios 3 adapter.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 289	1969-57A	1969 Jul 10.38 4.80 days 1969 Jul 15.18	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Jul 14.1	65.40	89.69	6638	194	325	0.010	41
D	Cosmos 289 rocket	1969-57B	1969 Jul 10.38 5.69 days 1969 Jul 16.07	Cylinder 2500?	7.5 long 2.6 dia	1969 Jul 11.1	65.39	89.55	6631	191	314	0.009	36
D	Luna 15 launcher rocket	1969-58B	1969 Jul 13.13 3.70 days 1969 Jul 16.83	Cylinder 4000?	12 long? 4 dia	1969 Jul 13.4	51.55	88.72	6593	182	247	0.005	352
D	Luna 15 launcher	1969-58C	1969 Jul 13.13 3.60 days 1969 Jul 16.73	-	-	1969 Jul 13.3	51.50	88.71	6592	190	238	0.004	320
D 3M R	Apollo 11**	1969-59A	1969 Jul 16.56 8.14 days 1969 Jul 24.70	Cone-cylinder 28800 full 12050 empty	11.15 long 3.91 dia	1969 Jul 16.6 1969 Jul 16.8	32.51 33.3	88.03 24400	6562 273 000	183 174	184 533 000	0 0.976	183 30*
						In selenocentric orbit 1969 Jul 19.73 to Jul 22.21							
	Saturn IV B [Saturn 506]	1969-59B	1969 Jul 16.56 Indefinite	Cylinder 13300	18.7 long 6.6 dia	1969 Jul 16.6	32.51	88.03	6562	183	184	0	183
						Entered heliocentric orbit 1969 Jul 16.76							
D	LEM 5† Descent stage	1969-59D	1969 Jul 16.56 4.29 days 1969 Jul 20.85	Octagon + 4 legs 10243 full 2033 empty	1.57 high 3.13 wide	1969 Jul 16.8	33.3	24400	273 000	174	533 000	0.976	30*
						Entered selenocentric orbit 1969 Jul 19.73 Landed on Moon 1969 July 20.85							
	LEM 5 Ascent stage	1969-59C	1969 Jul 16.56 Indefinite	Box + 2 tanks 4818 full 2179 empty	2.52 high 3.76 wide 3.13 deep	1969 Jul 16.8	33.3	24400	273 000	174	533 000	0.976	30*
						On Moon's surface 1969 Jul 20.85 to Jul 21.75 Now in selenocentric orbit							

** Apollo attached to LEM, separated from Saturn IV B on Jul 16.76. First manned landing on Moon.

† LEM with 2 crew members, separated from Apollo on Jul 20.74
LEM ascent stage launched from Moon Jul 21.75; re-joined Apollo Jul 21.90.

* Approximate orbits.

Space Vehicle: Luna 15, 1969-58A

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 290	1969-60A	1969 Jul 22.52 7.79 days 1969 Jul 30.31	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Jul 24.1	65.40	89.75	6641	194	332	0.010	44
D	Cosmos 290 rocket	1969-60B	1969 Jul 22.52 6.75 days 1969 Jul 29.27	Cylinder 2500?	7.5 long 2.6 dia	1969 Jul 24.1	65.41	89.52	6630	183	320	0.010	39
D	Molniya 1M	1969-61A	1969 Jul 22.54 696 days 1971 Jun 18	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1969 Jul 31.5 1969 Sep 16.0 1970 Oct 31.7	64.90 64.90 64.90	710.94 717.65 717.46	26387 26553 26549	499 525 316	39519 39825 40025	0.740 0.740 0.748	285 - -
D	Molniya 1M launcher rocket	1969-61B	1969 Jul 22.54 36.89 days 1969 Aug 28.43	Cylinder 2500?	7.5 long 2.6 dia	1969 Jul 23.9	64.93	91.73	6738	228	492	0.020	72
D	Molniya 1M launcher	1969-61C	1969 Jul 22.54 32.32 days 1969 Aug 23.86	Irregular	-	1969 Jul 23.9	64.93	91.90	6747	213	524	0.023	69
D	Molniya 1M rocket	1969-61D	1969 Jul 22.54 688 days 1971 Jun 10	Cylinder 440	2.0 long 2.0 dia	1969 Jul 29.5 1969 Dec 1.0 1970 Oct 31.7	64.89 64.88 64.88	707.80 707.84 707.58	26309 26311 26304	486 548 307	39376 39318 39545	0.739 0.737 0.746	285 - -
D	Fragments	1969-61E-G											
	[Thor Burner 2]	1969-62A	1969 Jul 23.19 80 years	12-faced Frustum 195	1.64 long 1.31 to 1.10 dia	1969 Jul 25.1	98.80	101.36	7200	788	856	0.005	2
	Burner 2 rocket	1969-62B	1969 Jul 23.19 60 years	Sphere-cone 66	1.32 long 0.94 dia	1969 Jul 23.6	98.78	101.36	7200	787	857	0.005	1

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	[Thorad Agena D]	1969-63A	1969 Jul 24.06 30.44 days 1969 Aug 23.50	Cylinder 2000?	8 long? 1.5 dia	1969 Jul 27.9	74.98	88.49	6577	178	220	0.003	123
	Intelsat 3E (F-5)	1969-64A	1969 Jul 26.09 20 years	Cylinder 292 full	1.04 long 1.42 dia	1969 Jul 30.7 1973 Jan 1.0	30.33 30.33	146.42 138.4	9212 8863	271 268	5397 4701	0.278 0.250	204 -
D	Intelsat 3E rocket	1969-64B	1969 Jul 26.09 355.67 days 1970 Jul 16.76	Sphere-cone 66	1.32 long 0.94 dia	1969 Aug 4.9 1970 Apr 14.4	30.37 30.26	146.17 111.65	9201 7689	271 261	5375 2360	0.277 0.137	227 140
19d	Fragments	1969-64C-I											
D	[Thorad Agena D]	1969-65A	1969 Jul 31.44 1253.28 days 1973 Jan 4.7?	Cylinder 2000?	8 long? 1.5 dia	1969 Aug 1.5 1970 Oct 1.3 1971 Nov 16.0	75.02 74.97 75.00	94.67 93.98 93.25	6880 6847 6812	462 439 410	541 498 457	0.006 0.004 0.003	238 - -
D	Cosmos 291	1969-66A	1969 Aug 6.24 33.70 days 1969 Sep 8.94	Cylinder?	4 long? 2 dia?	1969 Aug 7.2	62.24	91.46	6726	147	548	0.030	63
D	Cosmos 291 rocket	1969-66B	1969 Aug 6.24 5.11 days 1969 Aug 11.35	Cylinder 1500?	8 long? 2.5 dia?	1969 Aug 8.0	62.23	90.71	6690	143	481	0.025	63
D	Zond 7 launcher	1969-67B	1969 Aug 8.00 2.17 days 1969 Aug 10.17	-	-	1969 Aug 8.7	51.51	88.17	6565	183	191	0.001	139
D	Zond 7 launcher rocket	1969-67C	1969 Aug 8.00 4.37 days 1969 Aug 12.37	Cylinder 4000?	12 long? 4 dia	1969 Aug 10.1	51.52	88.46	6580	190	214	0.002	330
D	Fragment	1969-67D											

Space vehicle: Zond 7, 1969-67A, passed around the Moon Aug 11.18; was recovered on Earth at Aug 14.76

Year of launch 1969 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	OSO 6	1969-68A	1969 Aug 9.33 20 years	Nonagonal box + vane 290	0.94 long 1.12 dia	1969 Aug 10.8	32.96	94.95	6901	491	554	0.005	282
D	PAC 1* (OSO 6 rocket)	1969-68B	1969 Aug 9.33 2819 days 1977 Apr 28	Cylinder 470? payload 120	4.9 long 1.43 dia	1969 Aug 13.8 1971 Feb 1.0	32.95 32.95	94.89 94.23	6898 6865	485 460	554 514	0.005 0.004	311
T	ATS 5†	1969-69A	1969 Aug 12.46 > million years	Cylinder 821 full 433 empty	1.83 long 1.52 dia	1969 Aug 23.2 1969 Nov 1.0	2.6 2.5	1463.8 1435.9	42705 42162	35760 35777	36894 35790	0.013 0.0002	291
	ATS 5 rocket	1969-69B	1969 Aug 12.46 200 000 years	Cylinder 1815	8.6 long 3.0 dia	1969 Sep 16.0	17.55	703.1	26192	2209	37419	0.672	185
	ATS 5** apogee motor	1969-69D	1969 Aug 12.46 > million years	Cone 388? full 39? empty	1.3 long? 0.5 dia?	1969 Sep 5	2.6	1463.8	42705	35760	36894	0.013	291
	Fragment	1969-69C											
	Cosmos 292	1969-70A	1969 Aug 13.92 100 years	Cylinder + paddles? 750?	2 long? 1 dia?	1969 Aug 28.8	74.06	99.96	7134	746	765	0.001	71
	Cosmos 292 rocket	1969-70B	1969 Aug 13.92 80 years	Cylinder 2200?	7.4 long 2.4 dia	1969 Aug 22.6	74.06	99.85	7129	738	763	0.002	58
	Fragment	1969-70C											

* Package Attitude Control.

** Separated from ATS 5 on 1969 Sep 5.

† Applications Technology Satellite.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 293*	1969-71A	1969 Aug 16.50 11.93 days 1969 Aug 28.43	Sphere-cylinder 5900?	5.9 long? 2.4 dia	1969 Aug 16.8	51.77	89.08	6610	208	256	0.004	44
D	Cosmos 293 rocket	1969-71B	1969 Aug 16.50 3.93 days 1969 Aug 20.43	Cylinder 2500?	7.5 long 2.6 dia	1969 Aug 16.8	51.77	88.94	6603	202	248	0.003	31
D R	Cosmos 294	1969-72A	1969 Aug 19.54 7.79 days 1969 Aug 27.33	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Aug 20.3	65.40	89.79	6643	200	329	0.010	48
D	Cosmos 294 rocket	1969-72B	1969 Aug 19.54 7.62 days 1969 Aug 27.16	Cylinder 2500?	7.5 long 2.6 dia	1969 Aug 20.3	65.40	89.65	6636	195	320	0.009	43
D	Cosmos 295	1969-73A	1969 Aug 22.60 101.15 days 1969 Dec 1.75	Ellipsoid 400?	1.8 long 1.2 dia	1969 Aug 28.1	71.01	91.95	6748	270	469	0.015	77
D	Cosmos 295 rocket	1969-73B	1969 Aug 22.60 49.56 days 1969 Oct 11.16	Cylinder 1500?	8 long 1.65 dia	1969 Aug 27.4	71.01	91.80	6741	272	453	0.013	79
D R	[Titan 3B Agena D]	1969-74A	1969 Aug 22.67 16 days 1969 Sep 7	Cylinder 3000?	8 long? 1.5 dia	1969 Aug 24.7 1969 Aug 25.0 1969 Sep 1.1 1969 Sep 2.1	108.00 107.99 107.99 107.96	89.5? 89.74 89.29 89.84	6628 6639 6618 6644	133 136 130 130	366 386 349 402	0.018 0.019 0.017 0.021	130 131 119 122

* Telemetry suggests Cosmos 293 carried a pickaback capsule, but none was apparently tracked or designated

Year of launch 1969 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 296	1969-75A	1969 Aug 29.38 7.90 days 1969 Sep 6.28	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Aug 31.2	64.95	89.59	6633	207	302	0.007	50
D	Cosmos 296 rocket	1969-75B	1969 Aug 29.38 6.91 days 1969 Sep 5.29	Cylinder 2500?	7.5 long 2.6 dia	1969 Aug 30.4	64.95	89.42	6624	210	282	0.005	41
D R	Cosmos 297	1969-76A	1969 Sep 2.46 7.84 days 1969 Sep 10.30	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Sep 5.8	72.89	89.66	6635	205	309	0.008	47
D	Cosmos 297 rocket	1969-76B	1969 Sep 2.46 9 days 1969 Sep 11	Cylinder 2500?	7.5 long 2.6 dia	1969 Sep 3.1	72.89	89.53	6629	205	296	0.007	48
D R?	Cosmos 298	1969-77A	1969 Sep 15.67 0.06 day 1969 Sep 15.73	Cylinder	2 long? 1 dia?	1969 Sep 15.7	49.60	87.31	6523	127	162	0.003	-
D	Cosmos 298 rocket	1969-77B	1969 Sep 15.67 0.3 day? 1969 Sep 16	Cylinder 1500?	8 long? 2.5 dia?	1969 Sep 15.9	49.55	87.21	6518	123	156	0.003	24
D	Cosmos 298 launch platform	1969-77C	1969 Sep 15.67 0.5 day? 1969 Sep 16	Irregular	-	1969 Sep 16.0	49.55	87.45	6530	134	169	0.003	69
D	Fragments	1969-77D,E											

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 299	1969-76A	1969 Sep 18.36 3.98 days 1969 Sep 22.34	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Sep 19.4	64.97	89.41	6624	207	284	0.006	62
D	Cosmos 299 rocket	1969-76B	1969 Sep 18.36 5.69 days 1969 Sep 24.05	Cylinder 2500?	7.5 long 2.6 dia	1969 Sep 19.5	64.98	89.16	6612	206	261	0.004	54
D	[Thorad Agena D]	1969-79A	1969 Sep 22.88 19.74 days 1969 Oct 12.62	Cylinder 2000?	8 long? 1.5 dia	1969 Sep 24.3	85.03	88.83	6594	178	253	0.006	134
D	Capsule*	1969-79B	1969 Sep 22.88 600.84 days 1971 May 16.72	Octagon? 60?	0.3 long? 0.9 dia?	1969 Sep 29.7 1970 Oct 1.3 1971 Feb 1.0	85.16 85.16 85.16	94.51 93.23 92.22	6871 6808 6760	490 427 380	496 434 383	0.0005 0.0005 0.0002	305 - -
D	Cosmos 300**	1969-80A	1969 Sep 23.59 4 days 1969 Sep 27	Cylinder 19400? full	7 long 3.9 dia	1969 Sep 24.3 1969 Sep 27.4	51.52 51.52	88.16 87.54	6565 6533	184 148	189 162	0.0004 0.0011	193 317
D	Cosmos 300 rocket	1969-80B	1969 Sep 23.59 3.44 days 1969 Sep 27.03	Cylinder 4000?	12 long? 4 dia	1969 Sep 24.9	51.54	88.03	6558	179	181	0.0002	203
D R	Cosmos 301	1969-81A	1969 Sep 24.51 7.76 days 1969 Oct 2.27	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Sep 25.4	65.41	89.34	6620	195	289	0.007	34
D	Cosmos 301 rocket	1969-81B	1969 Sep 24.51 5.00 days 1969 Sep 29.51	Cylinder 2500?	7.5 long 2.6 dia	1969 Sep 25.6	65.40	89.13	6610	198	266	0.005	19

* 1969-79B ejected from 1969-79A on 1969 Sep 22.95.

**Probably an attempted lunar probe. (Payload 5600 kg?)

Year of launch 1969 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Capsule	1969-82A	1969 Sep 30.57 394.65 days 1970 Oct 30.22	Octagon? 60?	0.3 long? 0.9 dia?	1969 Oct 7.1 1970 Mar 9.9 1970 Jul 1.3	69.64 69.64 69.64	93.91 93.28 92.38	6843 6813 6768	446 419 381	484 450 399	0.003 0.002 0.001	58 189 -
	Timation 2*	1969-82B	1969 Sep 30.57 900 years	Cylinder + boom? 57	1.1 long 0.4 dia	1970 Mar 3.1	70.02	103.48	7301	906	940	0.002	217
	[Thorad Agena D]	1969-82C	1969 Sep 30.57 600 years	-	-	1970 Feb 27.2	70.02	103.49	7302	906	941	0.002	222
	[Thorad Agena D]	1969-82D	1969 Sep 30.57 600 years	-	-	1970 Jan 3.2	70.02	103.49	7302	907	940	0.002	284
	[Thorad Agena D]	1969-82E	1969 Sep 30.57 600 years	-	-	1970 Feb 28.2	70.02	103.49	7302	906	941	0.002	221
	[Thorad Agena D]	1969-82F	1969 Sep 30.57 600 years	-	-	1970 Feb 3.4	70.03	103.49	7302	906	941	0.002	251
	[Thorad Agena D]	1969-82G	1969 Sep 30.57 600 years	-	-	1970 Feb 2.4	70.01	103.48	7301	906	940	0.002	254
	Tempsat 2	1969-82H	1969 Sep 30.57 750 years	Sphere (black) 14.5	0.41 dia	1970 Mar 2.2	70.02	103.48	7301	906	940	0.002	219

* Time/navigation satellite

1969-82 continued on page 208

Year of launch 1969 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	SOICAL* cylinder	1969-82J	1969 Sep 30.57 80 years	Cylinder 2.4	1.02 long 0.25 dia	1970 Feb 23.8	70.02	103.46	7300	904	940	0.002	232
	SOICAL cone	1969-82K	1969 Sep 30.57 150 years	Cone 3.4	0.66 long 0.51 dia	1970 Feb 22.8	70.01	103.50	7302	903	945	0.003	228
	Agena D rocket	1969-82AB	1969 Sep 30.57 600 years	Cylinder 700?	6 long? 1.5 dia	1969 Oct 22.5	69.96	105.22	7383	918	1092	0.012	87
43d	Fragments	1969-82L-KL											
D	Boreas (ESRO 1B)**	1969-83A	1969 Oct 1.94 52.47 days 1969 Nov 23.41	Cone-cylinder 80	1.52 long 0.76 dia	1969 Oct 3.1	85.11	91.39	6718	291	389	0.007	313
D	Boreas rocket	1969-83B	1969 Oct 1.94 32.36 days 1969 Nov 3.30	Cylinder 24	1.50 long 0.46 dia	1969 Oct 5.9	85.13	91.36	6717	296	381	0.006	309
D	Fragments	1969-83C,D											
	Meteor 2	1969-84A	1969 Oct 6.07 60 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1969 Oct 6.7	81.26	97.70	7025	613	681	0.005	131
	Meteor 2 rocket	1969-84B	1969 Oct 6.07 60 years	Cylinder 1440	3.8 long 2.6 dia	1969 Oct 8.4	81.24	97.86	7033	550	760	0.015	163

* Space object identification calibration.

** European Space Research Organization.

Year of launch 1969 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D 2M R	Soyuz 6*	1969-85A	1969 Oct 11.47 4.94 days 1969 Oct 16.41	Sphere-cylinder + 2 wings 6577	7.5 long 2.2 dia	1969 Oct 11.9	51.68	88.67	6590	192	231	0.003	3
D	Soyuz 6 rocket	1969-85B	1969 Oct 11.47 1.08 days 1969 Oct 12.55	Cylinder 2500?	7.5 long 2.6 dia	1969 Oct 11.8	51.67	88.15	6564	156	215	0.004	303
D 3M R	Soyuz 7	1969-86A	1969 Oct 12.45 4.94 days 1969 Oct 17.39	Sphere-cylinder + 2 wings 6570	7.5 long 2.2 dia	1969 Oct 14.5	51.65	88.77	6595	210	223	0.001	338
D	Soyuz 7 rocket	1969-86B	1969 Oct 12.45 2.09 days 1969 Oct 14.54	Cylinder 2500?	7.5 long 2.6 dia	1969 Oct 13.2	51.65	88.37	6575	191	202	0.001	348
D 2M R	Soyuz 8	1969-87A	1969 Oct 13.43 4.95 days 1969 Oct 18.38	Sphere-cylinder + 2 wings 6646	7.5 long 2.2 dia	1969 Oct 16.0	51.65	88.72	6592	201	227	0.002	40
D	Soyuz 8 rocket	1969-87B	1969 Oct 13.43 1.97 days 1969 Oct 15.40	Cylinder 2500?	7.5 long 2.6 dia	1969 Oct 14.6	51.66	88.13	6563	177	192	0.001	52
D	Intercosmos 1	1969-88A	1969 Oct 14.57 79.98 days 1970 Jan 2.55	Ellipsoid + 6 panels 400?	1.8 long 1.2 dia	1969 Oct 15.1	48.38	93.31	6818	254	626	0.027	112
D	Intercosmos 1 rocket	1969-88B	1969 Oct 14.57 63.06 days 1969 Dec 16.63	Cylinder 1500?	8 long 1.65 dia	1969 Oct 15.1	48.37	93.24	6815	249	624	0.027	111

* Soyuz 6, 7 and 8 closed to within a few hundred metres of each other in pairs at various times.

Year of launch 1969 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 302	1969-89A	1969 Oct 17.49 7.78 days 1969 Oct 25.27	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Oct 18.8	65.41	89.69	6638	198	321	0.009	48
D	Cosmos 302 rocket	1969-89B	1969 Oct 17.49 7.11 days 1969 Oct 24.60	Cylinder 2500?	7.5 long 2.6 dia	1969 Oct 18.2	65.40	89.55	6631	196	310	0.009	44
D	Cosmos 303	1969-90A	1969 Oct 18.42 97.41 days 1970 Jan 23.83	Ellipsoid 400?	1.8 long 1.2 dia	1969 Oct 20.6	70.99	91.91	6746	270	466	0.015	80
D	Cosmos 303 rocket	1969-90B	1969 Oct 18.42 50.02 days 1969 Dec 7.44	Cylinder 1500?	8 long 1.65 dia	1969 Oct 20.1	71.00	91.80	6741	269	456	0.014	82
	Cosmos 304	1969-91A	1969 Oct 21.54 100 years	Cylinder + paddles? 750?	2 long? 1 dia?	1969 Oct 24.8	74.04	99.87	7130	742	761	0.001	320
	Cosmos 304 rocket	1969-91B	1969 Oct 21.54 80 years	Cylinder 2200?	7.4 long 2.4 dia	1969 Oct 24.5	74.05	99.74	7124	734	757	0.002	344
D	Cosmos 305*	1969-92A	1969 Oct 22.59 2.08 days 1969 Oct 24.67	Cylinder 19400? full	7 long 3.9 dia	1969 Oct 23.3	51.52	88.23	6569	175	206	0.002	293
D	Cosmos 305 rocket	1969-92B	1969 Oct 22.59 2.2 days 1969 Oct 24.8	Cylinder 4000?	12 long? 4 dia	1969 Oct 23.6	51.51	88.17	6565	171	203	0.002	285

* Possibly an attempted lunar probe. (Payload 5600 kg?)

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 306	1969-93A	1969 Oct 24.41 11.87 days 1969 Nov 5.28	Sphere-cylinder 5700?	5.0 long 2.4 dia	1969 Oct 25.1	64.97	89.64	6635	215	299	0.006	54
D	Cosmos 306 rocket	1969-93B	1969 Oct 24.41 5.49 days 1969 Oct 29.90	Cylinder 2500?	7.5 long 2.6 dia	1969 Oct 25.1	64.96	89.45	6626	203	293	0.007	45
D	Cosmos 307	1969-94A	1969 Oct 24.55 431.86 days 1970 Dec 30.41	Ellipsoid 400?	1.8 long 1.2 dia	1969 Oct 26.7 1970 Mar 31.9 1970 Aug 31.7	48.39 48.35 48.3	109.04 104.66 98.81	7564 7359 7083	214 210 201	2157 1752 1208	0.128 0.105 0.071	107 - -
D	Cosmos 307 rocket	1969-94B	1969 Oct 24.55 268.49 days 1970 Jul 20.04	Cylinder 1500?	8 long 1.65 dia	1969 Oct 26.6 1970 Jan 31.7 1970 May 1.0	48.41 48.3 48.3	108.78 104.18 98.82	7552 7337 7083	210 205 199	2138 1712 1211	0.128 0.103 0.071	107 - -
D	[Titan 3B Agena D]	1969-95A	1969 Oct 24.76 15 days 1969 Nov 8	Cylinder 3000?	8 long? 1.5 dia	1969 Oct 25.5	108.04	93.39	6816	136	740	0.044	144
D	Cosmos 308	1969-96A	1969 Nov 4.50 60.99 days 1970 Jan 4.49	Ellipsoid 400?	1.8 long 1.2 dia	1969 Nov 5.2	71.02	91.34	6718	271	408	0.010	68
D	Cosmos 308 rocket	1969-96B	1969 Nov 4.50 32.35 days 1969 Dec 6.85	Cylinder 1500?	8 long 1.65 dia	1969 Nov 5.5	71.02	91.20	6711	271	395	0.009	66

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Azur (GRS A) ††	1969-97A	1969 Nov 8.08 100 years	Cone-cylinder 71	1.13 long 0.76 dia	1969 Nov 10.5	102.96	122.00	8147	387	3150	0.170	158
	Azur rocket	1969-97B	1969 Nov 8.08 40 years	Cylinder 24	1.50 long 0.46 dia	1969 Nov 8.6	102.97	122.02	8148	390	3149	0.169	161
	Fragments	1969-97C-F											
D R	Cosmos 309	1969-98A	1969 Nov 12.48 7.75 days 1969 Nov 20.23	Sphere-cylinder 5900?	5.9 long 2.4 dia	1969 Nov 14.2	65.40	89.99	6653	185	364	0.014	89
D	Cosmos 309 rocket	1969-98B	1969 Nov 12.48 10.31 days 1969 Nov 22.79	Cylinder 2500?	7.5 long 2.6 dia	1969 Nov 13.1	65.41	89.95	6651	192	353	0.012	97
D	Fragments	1969-98C-E †											
D	Apollo 12**	1969-99A	1969 Nov 14.68	Cone-cylinder	11.15 long	1969 Nov 14.7	32.56	88.15	6569	183	199	0.001	→
3M			10.19 days	28790, then	3.91 dia	1969 Nov 14.9	33.2	18150	226087	207	439 210	0.971	30°
R			1969 Nov 24.87	11250		In selenocentric orbit 1969 Nov 18.16 to Nov 21.87							
	Saturn IV B [Saturn 507]	1969-99B	1969 Nov 14.68 Indefinite	Cylinder 13300	18.7 long 6.6 dia	1969 Nov 14.7	32.56	88.15	6569	183	199	0.001	→
						1969 Nov 14.9	31.6	60480	518 800	163 100	861 800	0.673	30°
D	LEM 6*** Ascent stage	1969-99C	1969 Nov 14.68 6.25 days 1969 Nov 20.93	Box + tanks 4774 full 2159 empty	2.52 high 3.76 wide 3.13 deep	1969 Nov 14.9	33.2	18150	226 087	207	439 210	0.971	30°
						On Moon's surface 1969 Nov 19.29 to Nov 20.60 Finally crashed on Moon 1969 Nov 20.93							
D	LEM 6 Descent stage	1969-99D	1969 Nov 14.68 4.61 days 1969 Nov 19.29	Octagon + cone + legs 10342 full 2211 empty	1.57 high 3.13 wide	1969 Nov 14.9	33.2	18150	226 087	207	439 210	0.971	30°
						Landed on Moon 1969 Nov 19.29							

** Apollo attached to LEM, separated from Saturn IV B on Nov 14.87.

*** LEM with 2 crew members, separated from Apollo on Nov 19.18. Ascent stage relaunched from Moon Nov 20.60; briefly docked with Apollo Nov 20.75.

† 1969-98E was a capsule, 0.9 m long, 1.9 m dia. Lifetime 18.09 days.

* Approximate orbits

†† German Research Satellite

Year of launch 1969 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 310	1969-100A	1969 Nov 15.36 7.92 days 1969 Nov 23.28	Sphere-cylinder 5530?	5 long? 2.4 dia	1969 Nov 16.2	65.00	89.91	6648	204	336	0.010	59
D	Cosmos 310 rocket	1969-100B	1969 Nov 15.36 7.91 days 1969 Nov 23.27	Cylinder 2500?	7.5 long 2.6 dia	1969 Nov 16.1	65.02	89.74	6640	204	319	0.009	52
	Skynet 1A	1969-101A	1969 Nov 22.03 >million years	Cylinder 243 full 126 empty	0.81 long 1.37 dia	1969 Dec 9.8 1970 Feb 16.0 1970 Jul 7.0 1970 Nov 25.6	2.40 2.2 1.88 1.56	1407.8 1436.0 1436.4 1436.4	41598 42162 42173 42172	34702 35779 35790 35794	35838 35788 35800 35794	0.012 0.0001 0.0001 0.0000	165 - 289 142
	Skynet 1A rocket	1969-101B	1969 Nov 22.03 10 years?	Sphere-cone 66	1.32 long 0.94 dia	1969 Nov 22.1 1970 Oct 1.0	27.73 27.19	656.9 632.6	25043 24411	245 215	37084 35850	0.735 0.730	181 -
D	Cosmos 311	1969-102A	1969 Nov 24.46 105.80 days 1970 Mar 10.26	Ellipsoid 400?	1.8 long 1.2 dia	1969 Nov 25.9	71.04	91.99	6749	273	469	0.014	79
D	Cosmos 311 rocket	1969-102B	1969 Nov 24.46 56.33 days 1970 Jan 19.79	Cylinder 1500?	8 long 1.65 dia	1969 Nov 25.2	71.03	91.88	6744	274	458	0.014	82
	Cosmos 312	1969-103A	1969 Nov 24.70 2500 years	Spheroid + paddles? 650?	1.6 dia?	1969 Dec 1.5	74.03	108.60	7540	1144	1179	0.002	339
	Cosmos 312 rocket	1969-103B	1969 Nov 24.70 1500 years	Cylinder 2200?	7.4 long 2.4 dia	1969 Nov 28.9	74.01	108.44	7532	1140	1168	0.002	6

Year of launch 1969 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 313	1969-104A	1969 Dec 3.56 11.73 days 1969 Dec 15.29	Sphere-cylinder 570?	5.0 long 2.4 dia	1969 Dec 4.1	65.40	89.07	6607	198	259	0.005	30
D	Cosmos 313 rocket	1969-104B	1969 Dec 3.56 3.26 days 1969 Dec 6.82	Cylinder 250?	7.5 long 2.6 dia	1969 Dec 4.3	65.42	88.85	6596	190	245	0.004	10
D	[Thorad Agena D]	1969-105A	1969 Dec 4.90 36.26 days 1970 Jan 10.16	Cylinder 200?	8 long? 1.5 dia	1969 Dec 6.4	81.48	88.61	6583	159	251	0.007	137
D	Cosmos 314	1969-106A	1969 Dec 11.54 100.63 days 1970 Mar 22.17	Ellipsoid 400?	1.8 long 1.2 dia	1969 Dec 13.3	71.01	91.93	6747	272	465	0.014	77
D	Cosmos 314 rocket	1969-106B	1969 Dec 11.54 46.93 days 1970 Jan 27.47	Cylinder 150?	8 long 1.65 dia	1969 Dec 13.3	71.00	91.65	6733	273	437	0.012	79
	Cosmos 315	1969-107A	1969 Dec 20.15 9½ years	Cylinder + paddles? 900?	2 long? 1 dia?	1969 Dec 21.8 1972 May 1.0	74.04 74.04	95.26 94.58	6908 6876	518 489	542 506	0.002 0.001	344 -
	Cosmos 315 rocket	1969-107B	1969 Dec 20.15 9½ years	Cylinder 220?	7.4 long 2.4 dia	1969 Dec 21.8 1972 May 16.5	74.04 74.04	95.12 94.48	6902 6871	511 481	537 505	0.002 0.002	8 -
D	Fragments	1969-107C-F											

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 316†	1969-108A	1969 Dec 23.39	Cylinder?	4 long?	1969 Dec 24.5	49.50	102.82	7273	152	1638	0.102	83
P			248.46 days	500?	1.5 dia	1970 June 20.0	49.48	95.20	6910	138	926	0.057	43
			1970 Aug 28.85			1970 Aug 28.0	49.45	87.90	6552	119	226	0.008	354
D	Cosmos 316 rocket	1969-108C	1969 Dec 23.39	Cylinder	8 long?	1969 Dec 26.0	49.49	102.15	7242	147	1581	0.099	88
			35.84 days	1500?	2.5 dia?								
			1970 Jan 28.23										
D	Fragment	1969-108B											
D	Cosmos 317	1969-109A	1969 Dec 23.58	Sphere-cylinder	6.5 long?	1969 Dec 24.4	65.41	89.34	6621	205	280	0.006	55
R			12.72 days	6300?	2.4 dia	1969 Dec 24.9	65.50	89.65	6636	211	304	0.007	52
			1970 Jan 5.30										
D	Cosmos 317 rocket	1969-109B	1969 Dec 23.58	Cylinder	7.5 long	1969 Dec 24.3	65.42	89.15	6611	201	265	0.005	45
			5 days	2500?	2.6 dia								
			1969 Dec 28										
D	Cosmos 317 engine*	1969-109C	1969 Dec 23.58	Cone	1.5 long?	1970 Jan 3.7	65.40	89.08	6608	190	269	0.006	46
			16 days	600? full	2 dia?								
			1970 Jan 8										
D	Fragment	1969-109D											
D	Intercosmos 2	1969-110A	1969 Dec 25.42	Ellipsoid	1.8 long	1969 Dec 27.0	48.40	98.48	7067	200	1178	0.069	108
			164.52 days	400?	1.2 dia	1970 Mar 31.9	48.38	95.08	6904	193	858	0.048	-
			1970 Jun 7.94										
D	Intercosmos 2 rocket	1969-110B	1969 Dec 25.42	Cylinder	8 long	1969 Dec 27.9	48.40	98.14	7051	207	1139	0.066	112
			86.33 days	1500?	1.65 dia								
			1970 Mar 21.75										

† Pieces recovered in Oklahoma, Kansas and Texas.

* 1969-109C ejected from 1969-109A about 1970 Jan 3.4. (Cosmos 317 carried supplementary charged-particles experiment.)

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 318	1970-01A	1970 Jan 9.39 11.90 days 1970 Jan 21.29	Sphere-cylinder 5700?	5.0 long 2.4 dia	1970 Jan 10.8	64.97	89.29	6618	203	277	0.006	31
D	Cosmos 318 rocket	1970-01B	1970 Jan 9.39 6.21 days 1970 Jan 15.60	Cylinder 2500?	7.5 long 2.6 dia	1970 Jan 10.7	64.97	89.11	6610	200	263	0.005	29
D	[Titan 3B Agena D]	1970-02A	1970 Jan 14.78 18 days 1970 Feb 1	Cylinder 3000?	8 long? 1.5 dia	1970 Jan 15.3	109.56	89.69	6637	134	383	0.019	133
	Intelsat 3F (F-6)	1970-03A	1970 Jan 15.01 > million years	Cylinder 293 full 137 empty	1.04 long 1.42 dia	1970 Jan 15.7 1970 Feb 16.0 1977 May 13.0	28.04 0.9 5.16	629.71 1436.1 1465.69	24386 42165 42742	267 35773 36185	35748 35801 36542	0.727 0.0003 0.004	181 - 10*
	Intelsat 3F rocket	1970-03B	1970 Jan 15.01 20 years	Sphere-cone 66	1.32 long 0.94 dia	1970 Jan 15.7	28.04	629.70	24385	267	35747	0.727	181
D	Cosmos 319	1970-04A	1970 Jan 15.57 167.13 days 1970 Jul 1.70	Ellipsoid 400?	1.8 long 1.2 dia	1970 Jan 16.2 1970 Apr 1.0	81.96 81.96	102.03 98.97	7232 7088	200 195	1508 1224	0.090 0.073	74 -
D	Cosmos 319 rocket	1970-04B	1970 Jan 15.57 106.42 days 1970 May 1.99	Cylinder 1500?	8 long 1.65 dia	1970 Jan 16.2	81.96	101.85	7224	199	1493	0.090	74

* Transmissions terminated after orbit change

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 320	1970-05A	1970 Jan 16.46 24.67 days 1970 Feb 10.13	Ellipsoid + annular tail? 400?	6.5 long? 1.2 dia?	1970 Jan 17.6	48.40	90.18	6665	247	326	0.006	139
D	Cosmos 320 rocket	1970-05B	1970 Jan 16.46 11.56 days 1970 Jan 28.02	Cylinder 1500?	8 long 1.65 dia	1970 Jan 18.5	48.41	90.19	6665	255	319	0.005	175
D	Fragments	1970-05C-G											
D	Cosmos 321 *	1970-06A	1970 Jan 20.85 61.39 days 1970 Mar 23.24	Ellipsoid 400?	1.8 long 1.2 dia	1970 Jan 23.9	70.95	92.07	6754	272	479	0.015	73
D	Cosmos 321 rocket	1970-06B	1970 Jan 20.85 45.56 days 1970 Mar 7.41	Cylinder 1500?	8 long 1.65 dia	1970 Jan 24.1	70.95	91.84	6742	270	458	0.014	72
D	Fragments	1970-06C-D											
D R	Cosmos 322	1970-07A	1970 Jan 21.50 7.78 days 1970 Jan 29.28	Sphere-cylinder 5530?	5 long? 2.4 dia	1970 Jan 22.2	65.41	89.65	6635	195	319	0.009	41
D	Cosmos 322 rocket	1970-07B	1970 Jan 21.50 4.33 days 1970 Jan 25.83	Cylinder 2500?	7.5 long 2.6 dia	1970 Jan 22.2	65.40	89.46	6626	190	306	0.009	38

* Ionospheric and geomagnetic studies

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	ITOS 1*	1970-08A	1970 Jan 23.48 10000 years	Box + 3 panels 309	1.02 square 1.22 long	1970 Feb 14.3	102.00	115.10	7837	1436	1482	0.003	219
	Oscar 5†	1970-08B	1970 Jan 23.48 10000 years	Rectangular box 18	0.43 x 0.30 x 0.15	1970 Jan 25.4	101.96	115.08	7836	1435	1481	0.003	263
	ITOS 1 second stage	1970-08C	1970 Jan 23.48 5000 years	Cylinder 350?	4.9 long 1.43 dia	1970 Jan 25.4	101.95	115.11	7838	1441	1478	0.002	262
	SERT 2** (Agena D)	1970-09A	1970 Feb 4.12 800 years	Cylinder + 2 wings 1500	7.6 long 1.52 dia 12.2 span	1970 Feb 11.8 1970 Jul 23.0 1970 Nov 1.0	99.13 99.13 99.13	105.15 106.94 106.23	7378 7458 7427	997 1079 1045	1003 1081 1052	0.0004 0.0001 0.0005	328 - -
D R	Cosmos 323	1970-10A	1970 Feb 10.50 7.78 days 1970 Feb 18.28	Sphere-cylinder 5530?	5 long? 2.4 dia	1970 Feb 11.2	65.43	89.65	6636	201	314	0.009	49
D	Cosmos 323 rocket	1970-10B	1970 Feb 10.50 5.08 days 1970 Feb 15.58	Cylinder 2500?	7.5 long 2.6 dia	1970 Feb 12.2	65.41	89.27	6617	189	288	0.008	35
	Ohsumi [Lambda 4S]	1970-11A	1970 Feb 11.18 80 years	Cylinder 38 (payload 12)	1.00 long 0.48 dia	1970 Feb 14.7	31.07	144.20	9117	339	5138	0.263	131

* Improved TIROS Operational Satellite. Oscar 5 is Australian; Ohsumi is Japanese. † Orbiting satellite carrying amateur radio

** Space Electric Rocket Test.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	[Thor Burner 2]	1970-12A	1970 Feb 11.36 80 years	12-faced frustum 195	1.64 long 1.31 to 1.10 dia	1970 Feb 16.7	98.71	101.39	7201	773	874	0.007	12
	Burner 2 rocket	1970-12B	1970 Feb 11.36 60 years	Sphere-cone 66	1.32 long 0.94 dia	1970 Feb 18.4	98.74	101.38	7201	772	874	0.007	7
D	Molniya 1N	1970-13A	1970 Feb 19.79 2048 days 1975 Sep 29	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1970 Feb 26.2 1970 May 16.5 1973 Oct 16.5	65.44 65.57 65.1	703.13 717.73 717.95	26194 26556 26564	461 470 940	39170 39885 39426	0.739 0.742 0.724	285 - -
D	Molniya 1N launcher	1970-13B	1970 Feb 19.79 17.42 days 1970 Mar 9.21	Irregular	-	1970 Feb 20.6	65.42	91.43	6723	205	485	0.021	72
D	Molniya 1N launcher rocket	1970-13C	1970 Feb 19.79 20.07 days 1970 Mar 11.86	Cylinder 2500?	7.5 long 2.6 dia	1970 Feb 20.6	65.43	91.21	6713	220	449	0.017	70
D	Molniya 1N rocket	1970-13D	1970 Feb 19.79 2150 days 1976 Jan 9	Cylinder 440	2.0 long 2.0 dia	1970 Mar 2.0 1973 Oct 1.0	65.46 65.25	699.06 698.70	26093 26084	465 925	38964 38486	0.738 0.720	285 -
D	Cosmos 324	1970-14A	1970 Feb 27.73 84.53 days 1970 May 23.26	Ellipsoid 400?	1.8 long 1.2 dia	1970 Feb 28.4	71.03	91.97	6749	275	466	0.014	75
D	Cosmos 324 rocket	1970-14B	1970 Feb 27.73 42.75 days 1970 Apr 11.48	Cylinder 1500?	8 long 1.65 dia	1970 Mar 1.1	71.04	91.74	6737	277	441	0.012	75

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 325	1970-15A	1970 Mar 4.51 7.79 days 1970 Mar 12.30	Sphere-cylinder 5530?	5 long? 2.4 dia	1970 Mar 6.2	65.39	89.77	6642	200	327	0.010	49
D	Cosmos 325 rocket	1970-15B	1970 Mar 4.51 5.60 days 1970 Mar 10.11	Cylinder 2500?	7.5 long 2.6 dia	1970 Mar 6.2	65.40	89.50	6628	194	306	0.008	39
D	[Thorad Agena D]	1970-16A	1970 Mar 4.93 21.98 days 1970 Mar 26.91	Cylinder 2000?	8 long? 1.5 dia	1970 Mar 5.6	88.02	88.76	6590	167	257	0.007	121
D	Capsule*	1970-16B	1970 Mar 4.93 615.19 days 1971 Nov 10.12	Octagon? 60?	0.3 long? 0.9 dia?	1970 Mar 7.2 1970 Aug 31.7 1971 Apr 1.0	88.14 88.14 88.14	94.16 93.58 92.49	6856 6828 6773	442 420 376	514 479 414	0.005 0.004 0.003	10 - -
D	DIAL/WIKA**	1970-17A	1970 Mar 10.51 3131 days 1978 Oct 5	Octagonal door-knob 63	1.01 long 0.63 dia	1970 Mar 12.4 1971 Aug 1.0	5.44 5.44	104.20 102.14	7344 7247	301 304	1631 1434	0.091 0.078	112 -
D	DIAL rocket/ MIKA	1970-17B	1970 Mar 10.51 1644 days 1974 Sep 9	Cylinder + nozzle 120 (payload 52)	2.60 long 0.80 dia	1970 Mar 11.7 1971 Feb 1.0 1972 Oct 1.0	5.42 5.42 5.42	104.67 102.49 99.20	7367 7264 7108	313 303 293	1665 1468 1166	0.092 0.080 0.061	105 - -
D R	Cosmos 326	1970-18A	1970 Mar 13.34 7.88 days 1970 Mar 21.22	Sphere-cylinder 5530?	5 long? 2.4 dia	1970 Mar 13.8	81.35	90.20	6661	203	363	0.012	85
D	Cosmos 326 rocket	1970-18B	1970 Mar 13.34 9.98 days 1970 Mar 23.32	Cylinder 2500?	7.5 long 2.6 dia	1970 Mar 14.3	81.36	90.00	6651	202	346	0.011	83

* 1970-16B ejected from 1970-16A on 1970 Mar 5.00.

** Diamant B - Allemand (French-German satellite).

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Meteor 3	1970-19A	1970 Mar 17.47 50 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1970 Mar 18.2	81.18	96.42	6984	537	635	0.007	236
	Meteor 3 rocket	1970-19B	1970 Mar 17.47 50 years	Cylinder 1440	3.8 long 2.6 dia	1970 Mar 18.8	81.17	96.55	6971	467	718	0.018	205
D	Fragment	1970-19C											
D	Cosmos 327	1970-20A	1970 Mar 18.61 306.41 days 1971 Jan 19.02	Ellipsoid 400?	1.8 long 1.2 dia	1970 Mar 19.6 1970 Aug 31.7	70.95 70.95	95.65 93.64	6928 6832	280 255	819 652	0.039 0.029	87 -
D	Cosmos 327 rocket	1970-20B	1970 Mar 18.61 192.44 days 1970 Sep 27.05	Cylinder 1500?	8 long 1.65 dia	1970 Mar 19.6 1970 Jul 1.3	70.94 70.94	95.57 93.39	6924 6819	272 254	819 628	0.039 0.027	85 -
	NATO 1 *	1970-21A	1970 Mar 20.99 > million years	Cylinder 243 full 117 empty	0.81 long 1.37 dia	1970 Mar 21.0 1970 May 1.0 1975 May 1.0	25.81 2.8 1.7	656.9 1403.4 1436.3	25043 41523 42168	281 34429 35745	37048 35860 35834	0.734 0.017 0.001	179 - -
	NATO 1 rocket	1970-21B	1970 Mar 20.99 20 years	Sphere-cone 66	1.32 long 0.94 dia	1970 Mar 21.3	25.67	655.4	24993	295	36934	0.733	179
	Fragment	1970-21C											
D R	Cosmos 328**	1970-22A	1970 Mar 27.49 12.77 days 1970 Apr 9.26	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1970 Mar 28.6 1970 Mar 29.8	72.86 72.86	89.54 89.75	6629 6639	203 206	299 316	0.007 0.008	56 59
D	Cosmos 328 rocket	1970-22B	1970 Mar 27.49 4.69 days 1970 Apr 1.18	Cylinder 2500?	7.5 long 2.6 dia	1970 Mar 28.4	72.87	89.39	6622	204	284	0.006	53

* North Atlantic Treaty Organisation

** Cosmos 328 manoeuvred, but the jettisoned engine was apparently not tracked or designated

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 329	1970-23A	1970 Apr 3.36 11.87 days 1970 Apr 15.23	Sphere-cylinder 5700?	5.0 long 2.4 dia	1970 Apr 4.1	81.33	88.79	6591	198	228	0.002	319
D	Cosmos 329 rocket	1970-23B	1970 Apr 3.36 2.44 days 1970 Apr 5.80	Cylinder 2500?	7.5 long 2.6 dia	1970 Apr 4.3	81.32	88.52	6578	185	214	0.002	316
	Cosmos 330	1970-24A	1970 Apr 7.47 9½ years	Cylinder + paddles? 900?	2 long? 1 dia?	1970 Apr 8.6 1972 Sep 16.0	74.06 74.06	95.22 94.63	6907 6878	514 492	543 508	0.002 0.001	334 -
	Cosmos 330 rocket	1970-24B	1970 Apr 7.47 9½ years	Cylinder 2200?	7.4 long 2.4 dia	1970 Apr 10.2 1973 Feb 1.0	74.06 74.06	95.12 94.56	6902 6875	507 480	541 513	0.002 0.002	336 -
	Nimbus 4	1970-25A	1970 Apr 8.35 1200 years	Conical skeleton + 2 paddles 620	3.00 long 1.45 dia	1970 Apr 10.2	99.89	107.29	7476	1095	1100	0.0003	8
	TOPO 1	1970-25B	1970 Apr 8.35 2000 years	Rectangular box 18	0.36 x 0.30 x 0.23	1970 Apr 9.5	99.76	107.09	7466	1064	1111	0.003	193
	Nimbus 4 rocket	1970-25C	1970 Apr 8.35 1000 years	Cylinder* 700?	6 long? 1.5 dia	1970 Apr 10.2	99.89	106.86	7454	1066	1086	0.001	331
25d	Fragments	1970-25D-NQ											
D R	Cosmos 331	1970-26A	1970 Apr 8.43 7.92 days 1970 Apr 16.35	Sphere-cylinder 5530?	5 long? 2.4 dia	1970 Apr 10.2	65.02	89.77	6641	206	320	0.009	45
D	Cosmos 331 rocket	1970-26B	1970 Apr 8.43 7.80 days 1970 Apr 16.23	Cylinder 2500?	7.5 long 2.6 dia	1970 Apr 10.1	65.01	89.60	6633	205	305	0.007	43

* Before explosion about 1970 Nov 4.

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Vela 11	1970-27A	1970 Apr 8.46 > million years	Icosahedron 259	1.27 dia	1970 Apr 9.4	32.41	6729	118060	111210	112160	0.005	280
	Vela 12	1970-27B	1970 Apr 8.46 > million years	Icosahedron 259	1.27 dia	1970 Apr 11.6	32.52	6745	118230	111500	112210	0.003	47
	Vela 11 rocket [Titan 3C]	1970-27C	1970 Apr 8.46 > million years	Cylinder 1500?	6 long? 3.0 dia	1970 Apr 10.4	32.36	3005	68980	15040	110170	0.690	178*
	Cosmos 332	1970-28A	1970 Apr 11.71 100 years	Cylinder + paddles 750?	2 long? 1 dia?	1970 Apr 12.4	74.05	100.01	7136	755	761	0.0004	110
	Cosmos 332 rocket	1970-28B	1970 Apr 11.71 80 years	Cylinder 2200?	7.4 long 2.4 dia	1970 Apr 12.4	74.05	99.90	7131	744	762	0.001	34
D	Apollo 13**	1970-29A	1970 Apr 11.80	Cone-cylinder 28890	11.15 long	1970 Apr 11.8	32.56	88.07	6564	186	186	0	-*
3H			5.95 days		3.91 dia	1970 Apr 12.0	33.2	26320	292520	200	572080	0.977	30*
R			1970 Apr 17.75					Passed 252 km beyond Moon 1970 Apr 15.02					
D	Saturn IVB [Saturn 508]	1970-29B	1970 Apr 11.80	Cylinder 13930	18.7 long	1970 Apr 11.8	32.56	88.07	6564	186	186	0	-*
			3.25 days		6.6 dia	1970 Apr 12.0	33.2	26320	292520	200	572080	0.977	30*
			1970 Apr 15.05					Crashed on Moon 1970 Apr 15.05					
D	LEM 7†	1970-29C	1970 Apr 11.80	Box + octagon + 4 legs 15190, then 7890	4.1 high 3.76 wide 3.13 deep	1970 Apr 12.0	33.2	26320	292520	200	572080	0.977	30*
			5.95 days					Passed 252 km beyond Moon 1970 Apr 15.02.					
			1970 Apr 17.75					Decayed in Earth's atmosphere					

* Approximate orbits.

** Apollo attached to LEM, separated from Saturn IVB on Apr 11.98.

† Apollo command module jettisoned Service module on Apr 17.55; and jettisoned LEM on Apr 17.70.

Year of Launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 333 †	1970-30A	1970 Apr 15.38 12.85 days 1970 Apr 28.23	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1970 Apr 15.6	81.34	89.11	6607	219	239	0.001	80
D	Cosmos 333 rocket	1970-30B	1970 Apr 15.38 3.20 days 1970 Apr 18.58	Cylinder 2500?	7.5 long 2.6 dia	1970 Apr 15.7	81.36	88.99	6601	213	233	0.002	8
D	Cosmos 333 engine*	1970-30C	1970 Apr 15.38 16.64 days 1970 May 2.02	Cone 600? full	1.5 long? 2 dia?	1970 Apr 28.2	81.34	88.66	6585	195	218	0.002	331
D	Fragment	1970-30D											
D	[Titan 3B Agena D]	1970-31A	1970 Apr 15.66 21 days 1970 May 6	Cylinder 3000?	8 long? 1.5 dia	1970 Apr 16.6 1970 Apr 24.3	110.97 110.96	89.70 89.91	6637 6648	130 131	388 408	0.019 0.021	120 121
	Intelsat 3G (F-7)	1970-32A	1970 Apr 23.03 > million years	Cylinder 293 full 137 empty	1.04 long 1.42 dia	1970 May 17.9	0.21	1436.2	42167	35772	35805	0.0004	345
	Intelsat 3G rocket	1970-32B	1970 Apr 23.03 20 years	Sphere-cone 66	1.32 long 0.94 dia	1970 Apr 23.7 1971 Dec 1.0	28.04 28.1	643.2 629.5	24682 24329	272 193	36336 35708	0.731 0.730	181 -
D	Cosmos 334	1970-33A	1970 Apr 23.56 108.39 days 1970 Aug 9.95	Ellipsoid 400?	1.8 long 1.2 dia	1970 Apr 24.2	70.92	92.10	6755	272	482	0.016	81
D	Cosmos 334 rocket	1970-33B	1970 Apr 23.56 23.05 days 1970 May 16.61	Cylinder 1500?	8 long 1.65 dia	1970 Apr 24.3	70.92	91.95	6748	249	491	0.018	76
D	Fragments	1970-33C-E											

* 1970-30C ejected from 1970-30A about 1970 Apr 28.2.

† Manoeuvrable

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	China 1	1970-34A	1970 Apr 24.57 100 years	Spheroid? 173	1 dia?	1970 Apr 27.7	68.44	114.09	7792	441	2386	0.125	141
	China 1 rocket	1970-34B	1970 Apr 24.57 50 years	Cylinder	-	1970 Apr 30.0	68.45	114.09	7792	441	2386	0.125	139
	Fragment	1970-34C											
D	Cosmos 335*	1970-35A	1970 Apr 24.94 58.15 days 1970 Jun 22.09	Ellipsoid 400?	1.8 long 1.2 dia	1970 Apr 25.5	48.40	90.97	6704	250	401	0.011	127
D	Cosmos 335 rocket	1970-35B	1970 Apr 24.94 22.72 days 1970 May 17.66	Cylinder 1500?	8 long 1.65 dia	1970 Apr 25.5	48.44	90.88	6699	250	392	0.011	127
	Cosmos 336	1970-36A	1970 Apr 25.71 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1970 Apr 30.2	74.04	115.49	7855	1464	1490	0.002	199
	Cosmos 337	1970-36B	1970 Apr 25.71 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1970 Apr 27.1	74.05	116.27	7890	1470	1554	0.005	258
	Cosmos 338	1970-36C	1970 Apr 25.71 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1970 Apr 28.6	74.03	115.89	7873	1472	1518	0.003	250
	Cosmos 339	1970-36D	1970 Apr 25.71 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1970 Apr 30.2	74.04	115.10	7837	1446	1472	0.002	111
	Cosmos 340	1970-36E	1970 Apr 25.71 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1970 May 2.2	74.04	114.70	7819	1409	1473	0.004	100

* Ultra-violet radiation studies

1970-36 continued on page 226

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 341	1970-36F	1970 Apr 25.71 6000 years	Spheroid 40?	1.0 long? 0.8 dia?	1970 Apr 27.3	74.04	113.97	7786	1345	1471	0.008	98
	Cosmos 342	1970-36G	1970 Apr 25.71 5000 years	Spheroid 40?	1.0 long? 0.8 dia?	1970 Apr 27.3	74.04	113.62	7770	1313	1471	0.010	94
	Cosmos 343	1970-36H	1970 Apr 25.71 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1970 May 1.7	74.02	114.32	7802	1374	1474	0.006	97
	Cosmos 336 rocket	1970-36J	1970 Apr 25.71 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1970 May 3.1	74.04	116.69	7910	1473	1590	0.007	257
	Meteor 4	1970-37A	1970 Apr 28.45 60 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1970 Apr 29.5	81.23	98.12	7046	625	710	0.006	89
	Meteor 4 rocket	1970-37B	1970 Apr 28.45 60 years	Cylinder 1440	3.8 long 2.6 dia	1970 May 4.1	81.24	98.34	7056	571	705	0.015	136
	Fragment	1970-37C											
D R	Cosmos 344	1970-38A	1970 May 12.43 7.85 days 1970 May 20.28	Sphere-cylinder 5530?	5 long? 2.4 dia	1970 May 13.2	72.90	89.83	6644	202	329	0.010	45
D	Cosmos 344 rocket	1970-38B	1970 May 12.43 7.61 days 1970 May 20.04	Cylinder 2500?	7.5 long 2.6 dia	1970 May 13.2	72.90	89.65	6635	204	309	0.008	34

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 345	1970-39A	1970 May 20.39 7.98 days 1970 May 28.37	Sphere-cylinder 5530?	5 long? 2.4 dia	1970 May 21.5	51.75	89.06	6609	192	270	0.006	13
D	Cosmos 345 rocket	1970-39B	1970 May 20.39 2.70 days 1970 May 23.09	Cylinder 2500?	7.5 long 2.6 dia	1970 May 20.8	51.76	88.97	6605	185	268	0.006	0
D	[Thorad Agena D]	1970-40A	1970 May 20.90 27.53 days 1970 Jun 17.43	Cylinder 2000?	8 long? 1.5 dia	1970 May 22.2	83.00	88.62	6583	162	247	0.006	141
D	Capsule* (Doppler Beacon 2)	1970-40B	1970 May 20.90 1387.24 days 1974 Mar 8.14	Octagon? 60?	0.3 long? 0.9 dia?	1970 May 22.4 1971 Jul 1.0 1973 Feb 1.0	83.12 83.12 83.12	94.59 93.92 92.61	6875 6843 6779	491 460 397	503 469 405	0.0009 0.0007 0.0006	61 - -
D 2H R	Soyuz 9	1970-41A	1970 Jun 1.79 17.71 days 1970 Jun 19.50	Sphere-cylinder + 2 wings 6500	7.5 long 2.2 dia	1970 Jun 2.0 1970 Jun 2.2 1970 Jun 3.5	51.64 51.66 51.67	88.47 89.06 89.48	6580 6609 6630	176 208 244	227 254 259	0.004 0.003 0.001	166 125 213
D	Soyuz 9 rocket	1970-41B	1970 Jun 1.79 1.83 days 1970 Jun 3.62	Cylinder 2500?	7.5 long 2.6 dia	1970 Jun 2.2	51.67	88.36	6574	194	198	0.0003	353
D R	Cosmos 346	1970-42A	1970 Jun 10.40 7.00 days 1970 Jun 17.40	Sphere-cylinder 5530?	5 long? 2.4 dia	1970 Jun 14.0	51.74	89.16	6614	197	274	0.006	36
D	Cosmos 346 rocket	1970-42B	1970 Jun 10.40 3.51 days 1970 Jun 13.91	Cylinder 2500?	7.5 long 2.6 dia	1970 Jun 12.6	51.74	88.46	6580	167	236	0.005	352

* 1970-40B ejected from 1970-40A about 1970 May 20.97.

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 347	1970-43A	1970 Jun 12.40 513.18 days 1971 Nov 7.58	Ellipsoid 400?	1.8 long 1.2 dia	1970 Jun 15.5 1970 Dec 1.0 1971 May 16.5	48.41 48.3 48.3	107.90 103.60 98.20	7511 7310 7054	216 213 204	2050 1650 1148	0.122 0.098 0.067	110 - -
D	Cosmos 347 rocket	1970-43B	1970 Jun 12.40 247.51 days 1971 Feb 14.91	Cylinder 1500?	8 long 1.65 dia	1970 Jun 15.5 1970 Oct 1.0	48.41 48.37	107.77 103.56	7505 7308	215 209	2039 1650	0.121 0.099	110 -
D	Cosmos 348 *	1970-44A	1970 Jun 13.21 41.88 days 1970 Jul 25.09	Ellipsoid 400?	1.8 long 1.2 dia	1970 Jun 13.9	70.99	93.10	6804	201	651	0.033	90
D	Cosmos 348 rocket	1970-44B	1970 Jun 13.21 25.88 days 1970 Jul 9.09	Cylinder 1500?	8 long 1.65 dia	1970 Jun 15.5	70.98	92.78	6788	201	619	0.031	88
D	Fragment	1970-44C											
D R	Cosmos 349	1970-45A	1970 Jun 17.54 7.79 days 1970 Jun 25.33	Sphere-cylinder 5530?	5 long? 2.4 dia	1970 Jun 18.0	65.39	89.81	6644	199	332	0.010	46
D	Cosmos 349 rocket	1970-45B	1970 Jun 17.54 5.33 days 1970 Jun 22.87	Cylinder 2500?	7.5 long 2.6 dia	1970 Jun 17.8	65.40	89.67	6637	191	326	0.010	42
	BMEWS 3 [Atlas Agena D]	1970-46A	1970 Jun 19.48 10 years?	Cylinder 700 full?	1.7 long? 1.4 dia?	1970 Jul 15.2	28.21	588.85	23310	178	33685	0.719	197
	Agena D rocket	1970-46B	1970 Jun 19.48 10 years?	Cylinder 700?	6 long? 1.5 dia	1970 Sep 1.4 1972 Jul 1.0 1975 Mar 1.0	27.98 28.4 28.06	579.51 508.6 445.4	23041 21106 19317	171 194 224	33154 29262 25654	0.716 0.689 0.658	230 - -

* International atmospheric and auroral studies

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Meteor 5	1970-47A	1970 Jun 23.60 400 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1970 Jun 25.3	81.23	102.16	7238	831	888	0.004	248
	Meteor 5 rocket	1970-47B	1970 Jun 23.60 300 years	Cylinder 1440	3.8 long 2.6 dia	1970 Jun 27.1	81.23	102.34	7246	810	926	0.008	189
D	[Titan 3B Agena D]	1970-48A	1970 Jun 25.62 11 days 1970 Jul 6	Cylinder 3000?	8 long? 1.5 dia	1970 Jun 26.9 1970 Jun 28.7	108.87 108.87	89.70 89.74	6637 6639	129 128	389 394	0.020 0.020	118 119
D	Molniya 1P	1970-49A	1970 Jun 26.14 2061 days 1976 Feb 16	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1970 Jul 7.5 1970 Aug 1.0 1973 Feb 1.0	65.37 65.34 65.45	704.70 717.55 717.43	26232 26551 26548	448 473 1531	39260 39872 38808	0.740 0.742 0.702	285 - -
D	Molniya 1P rocket	1970-49D	1970 Jun 26.14 2076 days 1976 Mar 2	Cylinder 440	2.0 long 2.0 dia	1970 Jul 8.4 1973 Feb 1.0	65.39 65.43	700.30 700.30	26123 26123	469 1479	39021 38011	0.738 0.699	285 -
D	Molniya 1P launcher rocket	1970-49C	1970 Jun 26.14 21.70 days 1970 Jul 17.84	Cylinder 2500?	7.5 long 2.6 dia	1970 Jun 27.7	65.39	91.30	6717	213	464	0.019	63
D	Molniya 1P launcher	1970-49B	1970 Jun 26.14 29.54 days 1970 Jul 25.68	Irregular -	-	1970 Jun 27.7	65.40	91.40	6722	225	462	0.018	69
D R	Cosmos 350	1970-50A	1970 Jun 26.50 11.93 days 1970 Jul 8.43	Sphere-cylinder 5700?	5.0 long 2.4 dia	1970 Jun 27.5	51.73	89.04	6608	202	258	0.004	26
D	Cosmos 350 rocket	1970-50B	1970 Jun 26.50 2.61 days 1970 Jun 29.11	Cylinder 2500?	7.5 long 2.6 dia	1970 Jun 26.9	51.74	88.87	6600	190	253	0.005	9

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 351	1970-51A	1970 Jun 27.32 108.15 days 1970 Oct 13.47	Ellipsoid 400?	1.8 long 1.2 dia	1970 Jun 29.4	70.99	91.93	6747	270	467	0.015	82
D	Cosmos 351 rocket	1970-51B	1970 Jun 27.32 52.2 days 1970 Aug 18.5	Cylinder 1500?	8 long 1.65 dia	1970 Jun 28.5	70.98	91.75	6738	270	450	0.013	81
D R	Cosmos 352	1970-52A	1970 Jul 7.44 7.95 days 1970 Jul 15.39	Sphere-cylinder 5530?	5 long? 2.4 dia	1970 Jul 8.2	51.78	89.46	6629	207	294	0.007	51
D	Cosmos 352 rocket	1970-52B	1970 Jul 7.44 4.59 days 1970 Jul 12.03	Cylinder 2500?	7.5 long 2.6 dia	1970 Jul 8.3	51.77	89.33	6622	187	301	0.009	32
D R	Cosmos 353	1970-53A	1970 Jul 9.57 11.72 days 1970 Jul 21.29	Sphere-cylinder 5700?	5.0 long 2.4 dia	1970 Jul 11.2	65.42	89.38	6622	204	284	0.006	58
D	Cosmos 353 rocket	1970-53B	1970 Jul 9.57 6.44 days 1970 Jul 16.01	Cylinder 2500?	7.5 long 2.6 dia	1970 Jul 10.3	65.44	89.23	6615	200	274	0.006	58?
D	[Thorad Agena D]	1970-54A	1970 Jul 23.06 26.99 days 1970 Aug 19.05	Cylinder 2000?	8 long? 1.5 dia	1970 Jul 25.2	60.00	90.04	6656	158	398	0.018	111
	Intelsat 3H (F-8)	1970-55A	1970 Jul 23.97 1 million years	Cylinder 137 empty	1.04 long 1.42 dia	1970 Jul 24.0 1970 Aug 1.0	27.98 13.3	642.7 1043	24666 34090	282 19400	36294 36030	0.730 0.244	189 -*
	Intelsat 3H rocket	1970-55B	1970 Jul 23.97 20 years	Sphere-cone 66	1.32 long 0.94 dia	1970 Aug 6.6	27.98	642.7	24666	282	36294	0.730	189

* Approximate orbit (satellite lost).

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R?	Cosmos 354	1970-56A	1970 Jul 28.92 0.06 day 1970 Jul 28.98	Cylinder	2 long? 1 dia?				Orbit similar to 1970-56C				
D	Cosmos 354 rocket	1970-56B	1970 Jul 28.92 0.36 day 1970 Jul 29.28	Cylinder 1500?	8 long? 2.5 dia?	1970 Jul 29.2	49.57	87.13	6514	114	157	0.005	158
D	Cosmos 354 launch platform	1970-56C	1970 Jul 28.92 0.49 day 1970 Jul 29.41	Irregular	-	1970 Jul 29.2	49.62	87.54	6534	134	178	0.003	58
D	Intercosmos 3	1970-57A	1970 Aug 7.13 121.31 days 1970 Dec 6.44	Ellipsoid 400?	1.8 long 1.2 dia	1970 Aug 9.3	48.41	99.70	7126	200	1295	0.077	110
D	Intercosmos 3 rocket	1970-57B	1970 Aug 7.13 102.57 days 1970 Nov 17.70	Cylinder 1500?	8 long 1.65 dia	1970 Aug 9.7	48.40	99.61	7122	201	1287	0.076	112
D R	Cosmos 355	1970-58A	1970 Aug 7.40 7.78 days 1970 Aug 15.18	Sphere-cylinder 5530?	5 long? 2.4 dia	1970 Aug 8.4	65.40	89.71	6639	199	322	0.009	45
D	Cosmos 355 rocket	1970-58B	1970 Aug 7.40 6.95 days 1970 Aug 14.35	Cylinder 2500?	7.5 long 2.6 dia	1970 Aug 9.1	65.39	89.45	6626	191	304	0.008	35
D	Cosmos 356*	1970-59A	1970 Aug 10.84 53.11 days 1970 Oct 2.95	Ellipsoid 400?	1.8 long 1.2 dia	1970 Aug 11.3	81.96	92.62	6780	231	573	0.025	80
D	Cosmos 356 rocket	1970-59B	1970 Aug 10.84 52.00 days 1970 Oct 1.84	Cylinder 1500?	8 long 1.65 dia	1970 Aug 11.4	81.96	92.49	6773	236	554	0.023	79

* Atmospheric and auroral studies

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Venus 7 launcher rocket	1970-60B	1970 Aug 17.23 1.17 days 1970 Aug 18.40	Cylinder 2500?	7.5 long 2.6 dia	1970 Aug 17.5	51.75	88.28	6570	182	202	0.002	280
D	Venus 7 launcher	1970-60C	1970 Aug 17.23 1.68 days 1970 Aug 18.91	Irregular	-	1970 Aug 17.4	51.70	88.51	6582	174	233	0.004	349
D	[Titan 3B Agena D]	1970-61A	1970 Aug 18.62 16 days 1970 Sep 3	Cylinder 3000?	8 long? 1.5 dia	1970 Aug 21.2 1970 Aug 25.0	110.95 110.98	89.67 90.49	6636 6676	151 152	365 444	0.016 0.022	124 123
	Skynet 1B	1970-62A	1970 Aug 19.51 uncertain	Cylinder 243 full 129 empty	0.81 long 1.37 dia	1970 Aug 20.2	28.04	636.5	24534	270	36041	0.729	181*
	Skynet 1B rocket	1970-62B	1970 Aug 19.51 20 years	Sphere-cone 66	1.32 long 0.94 dia	1970 Aug 20.2	28.04	636.5	24534	270	36041	0.729	181
D	Cosmos 357	1970-63A	1970 Aug 19.63 97.30 days 1970 Nov 24.93	Ellipsoid 400?	1.8 long 1.2 dia	1970 Aug 21.1	70.99	92.04	6752	272	476	0.015	73
D	Cosmos 357 rocket	1970-63B	1970 Aug 19.63 57 days 1970 Oct 15	Cylinder 1500?	8 long 1.65 dia	1970 Aug 22.0	70.98	91.81	6741	275	450	0.013	70
	Cosmos 358	1970-64A	1970 Aug 20.61 20 years	Cylinder + paddles? 900?	2 long? 1 dia?	1970 Aug 27.3	74.04	95.19	6905	515	539	0.002	316
	Cosmos 358 rocket	1970-64B	1970 Aug 20.61 8½ years	Cylinder 2200?	7.4 long 2.4 dia	1970 Aug 24.2 1973 Oct 1.0	74.03 74.03	95.08 94.40	6900 6867	505 471	539 507	0.003 0.003	325 -
D	Fragment	1970-64C											

Space Vehicle: Venus 7, 1970-60A. *Transfer orbit: present orbit unknown.

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 359*	1970-65A	1970 Aug 22.22 76.04 days 1970 Nov 6.26	Sphere-cylinder 1180	3.5 long 1.2 dia	1970 Aug 24.3	51.13	95.57	6927	208	890	0.049	60
D	Cosmos 359 launcher rocket	1970-65B	1970 Aug 22.22 7.06 days 1970 Aug 29.28	Cylinder 2500?	7.5 long 2.6 dia	1970 Aug 23.5	51.80	89.49	6631	207	298	0.007	37
D	Cosmos 359 rocket	1970-65D	1970 Aug 22.22 410 days 1971 Oct 6	Cylinder 2400**	2.0 long 2.0 dia	1970 Sep 1.0 1971 Feb 1.0 1971 Jun 1.0	51.13 51.13 51.13	95.31 93.58 91.92	6914 6830 6749	205 202 195	867 701 546	0.048 0.037 0.026	79 288 -
D	Fragments	1970-65C, E											
D	[Thorad Agena D]	1970-66A	1970 Aug 26.12 1673 days 1975 Mar 26	Cylinder 2000?	8 long? 1.5 dia	1970 Aug 29.3 1972 Apr 1.0 1974 Feb 15.0	74.99 74.99 74.99	94.51 93.87 92.57	6872 6841 6778	484 457 398	504 469 402	0.001 0.001 0.0003	259 - -
	Navy Navigation Satellite 19	1970-67A	1970 Aug 27.56 1300 years	Octagon + 4 vanes + boom 58?	0.25 long 0.46 dia	1970 Aug 29.2	90.02	107.04	7466	955	1221	0.018	245
	Altair rocket	1970-67B	1970 Aug 27.56 700 years	Cylinder 24	1.5 long 0.46 dia	1970 Sep 6.9	90.04	107.05	7467	952	1225	0.018	218
	Fragments	1970-67C-E											
D R	Cosmos 360 †	1970-68A	1970 Aug 29.36 9.93 days 1970 Sep 8.29	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1970 Sep 2.8	64.99	89.64	6635	209	305	0.007	37
D	Cosmos 360 rocket	1970-68B	1970 Aug 29.36 4.34 days 1970 Sep 2.70	Cylinder 2500?	7.5 long 2.6 dia	1970 Aug 31.1	65.00	88.91	6600	187	256	0.005	26
D	Cosmos 360 engine ***	1970-68C	1970 Aug 29.36 11 days 1970 Sep 9	Cone 600? full	1.5 long? 2 dia?	1970 Sep 7.7	64.93	88.61	6585	193	220	0.002	85
D	Fragments	1970-68D, E											

* Cosmos 359 was probably an attempted Venus probe.

** Mass before incomplete burn was approximately 5400kg

*** 1970-68C ejected from 1970-68A about 1970 Sep 7.4.

† Probably manoeuvrable

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	EMEWS 4 [Atlas Agena D]	1970-69A	1970 Sep 1.04 > million years	Cylinder 700 full? 350 empty?	1.7 long? 1.4 dia?	1970 Sep 1.0 1970 Oct 1.0	28.50 10.3	88.03 1441.9	6563 42279	179 31947	190 39855	0.001 0.094	242 -
	Agena D rocket	1970-69B	1970 Sep 1.04 10 years?	Cylinder 700?	6 long? 1.5 dia			Orbit similar to 1970-46B					
	[Thor Burner 2]	1970-70A	1970 Sep 3.36 80 years	12-faced frustum 195	1.64 long 1.31 to 1.10 dia	1970 Sep 4.9	98.73	101.30	7197	764	874	0.008	21
	Burner 2 rocket	1970-70B	1970 Sep 3.36 60 years	Sphere-cone 66	1.32 long 0.94 dia	1970 Sep 9.2	98.75	101.29	7197	765	872	0.007	7
D R	Cosmos 361	1970-71A	1970 Sep 8.44 12.8 days 1970 Sep 21.2	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1970 Sep 9.1 1970 Sep 13.2	72.87 72.87	89.59 90.09	6632 6656	209 203	298 353	0.007 0.011	56 37
D	Cosmos 361 rocket	1970-71B	1970 Sep 8.44 5.57 days 1970 Sep 14.01	Cylinder 2500?	7.5 long 2.6 dia	1970 Sep 8.7	72.85	89.47	6626	204	291	0.007	54
D	Cosmos 361 engine*	1970-71C	1970 Sep 8.44 27 days 1970 Oct 5	Cone 600? full	1.5 long? 2 dia?	1970 Sep 20.2	72.87	89.95	6650	209	334	0.009	25
D	Fragment	1970-71D											
D	Luna 16 launcher rocket	1970-72B	1970 Sep 12.56 3.19 days 1970 Sep 15.75	Cylinder 4000?	12 long? 4 dia	1970 Sep 12.9	51.53	88.70	6591	185	241	0.004	344
D	Luna 16 launcher	1970-72C	1970 Sep 12.56 3.29 days 1970 Sep 15.85	-	-	1970 Sep 12.9	51.50	88.71	6592	186	241	0.004	334

Space Vehicle: Luna 16, 1970-72A.

* 1970-71C ejected from 1970-71A about 1970 Sep 20.2.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 362	1970-73A	1970 Sep 16.50 392.40 days 1971 Oct 13.90	Ellipsoid 400?	1.8 long 1.2 dia	1970 Sep 18.0 1971 Apr 1.0	70.96 70.96	95.65 93.26	6928 6812	270 255	829 613	0.040 0.026	82 -
D	Cosmos 362 rocket	1970-73B	1970 Sep 16.50 193.33 days 1971 Mar 28.83	Cylinder 1500?	8 long 1.65 dia	1970 Sep 17.0 1971 Jan 1.0	70.96 70.96	95.51 93.27	6921 6813	271 252	815 617	0.039 0.027	83 252
D R	Cosmos 363	1970-74A	1970 Sep 17.35 11.86 days 1970 Sep 29.21	Sphere-cylinder 5700?	5.0 long 2.4 dia	1970 Sep 18.1	65.01	89.53	6629	208	294	0.007	62
D	Cosmos 363 rocket	1970-74B	1970 Sep 17.35 5.44 days 1970 Sep 22.79	Cylinder 2500?	7.5 long 2.6 dia	1970 Sep 18.1	65.00	89.33	6619	205	277	0.006	54
D R	Cosmos 364	1970-75A	1970 Sep 22.54 9.76 days 1970 Oct 2.30	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1970 Sep 25.7 1970 Oct 1.5	65.41 65.43	89.49 89.50	6628 6628	202 196	297 304	0.007 0.008	75 52
D	Cosmos 364 rocket	1970-75B	1970 Sep 22.54 5.96 days 1970 Sep 28.50	Cylinder 2500?	7.5 long 2.6 dia	1970 Sep 23.2	65.40	89.50	6628	204	296	0.007	59
D	Cosmos 364 engine*	1970-75C	1970 Sep 22.54 17 days 1970 Oct 9	Cone 600? full	1.5 long? 2 dia?	1970 Oct 5.2	65.39	91.16	6710	222	442	0.016	2

* 1970-75C ejected from 1970-75A about 1970 Oct 1.5.

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D RE	Cosmos 365	1970-76A	1970 Sep 25.59 0.06 day 1970 Sep 25.65	Cylinder	2 long? 1 dia?			Orbit similar to 1970-76B					
D	Cosmos 365 launch platform	1970-76B	1970 Sep 25.59 0.43 day 1970 Sep 26.02	Irregular	-	1970 Sep 25.9	49.66	87.49	6532	133	174	0.003	174
D	Cosmos 365 rocket	1970-76C	1970 Sep 25.59 0.3 day? 1970 Sep 25	Cylinder 1500?	8 long? 2.5 dia?	1970 Sep 25.7	49.66	87.20	6517	117	161	0.003	-
D	Molniya 1Q	1970-77A	1970 Sep 29.35 1999 days 1976 Mar 20	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1970 Oct 1.0 1970 Nov 1.0 1971 Sep 16.0	65.5 65.3 65.75	706.18 717.57 717.63	26268 26551 26553	480 723 400	39300 39623 39949	0.739 0.733 0.745	285 284 -
D	Molniya 1Q launcher	1970-77C	1970 Sep 29.35 24.08 days 1970 Oct 23.43	Irregular	-	1970 Sep 30.9	65.43	91.50	6727	228	469	0.018	74
D	Molniya 1Q launcher rocket	1970-77B	1970 Sep 29.35 16.77 days 1970 Oct 16.12	Cylinder 2500?	7.5 long 2.6 dia	1970 Oct 1.6	65.39	90.99	6702	205	443	0.018	57
D	Molniya 1Q rocket	1970-77D	1970 Sep 29.35 610 days 1972 May 31	Cylinder 440	2.0 long 2.0 dia	1970 Nov 1.0 1971 Apr 1.0 1971 Sep 1.0	65.41 65.6 65.8	704.67 704.43 704.07	26231 26225 26216	490 358 236	39215 39335 39439	0.738 0.743 0.748	- - -
D	Fragment	1970-77E											
D R	Cosmos 366	1970-78A	1970 Oct 1.35 11.9 days 1970 Oct 13.3	Sphere-cylinder 5700?	5.0 long 2.4 dia	1970 Oct 2.5	64.96	89.48	6628	204	295	0.007	39
D	Cosmos 366 rocket	1970-78B	1970 Oct 1.35 5 days 1970 Oct 6	Cylinder 2500?	7.5 long 2.6 dia	1970 Oct 3.1	64.96	89.13	6610	177	286	0.008	42

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 367[+]	1970-79A	1970 Oct 3.44 600 years	Cone-cylinder	6 long? 2 dia?	1970 Oct 6.8	65.28	104.53	7351	922	1024	0.007	312
D	Cosmos 367 rocket	1970-79B	1970 Oct 3.44 2.93 days 1970 Oct 6.37	Cylinder 1500?	8 long? 2.5 dia?	1970 Oct 4.9	65.21	89.21	6614	226	246	0.002	227
D	Cosmos 367 platform	1970-79C	1970 Oct 3.44 27.69 days 1970 Oct 31.13	Irregular	-	1970 Oct 4.8	65.09	89.60	6633	246	264	0.001	258
D	Fragments	1970-79D,E											
D B R	Cosmos 368	1970-80A	1970 Oct 8.53 5.98 days 1970 Oct 14.51	Sphere-cylinder 5900?	5.9 long 2.4 dia	1970 Oct 9.7	64.99	90.56	6680	204	400	0.015	56
D	Cosmos 368 rocket	1970-80B	1970 Oct 8.53 11.60 days 1970 Oct 20.13	Cylinder 2500?	7.5 long 2.6 dia	1970 Oct 9.7	65.00	90.43	6674	203	389	0.014	52
D	Capsule*	1970-80E	1970 Oct 8.53 27 days 1970 Nov 4	Ellipsoid 200?	0.9 long 1.9 dia	1970 Nov 1.0	64.9	88.70	6589	178	243	0.005	-
D	Fragments	1970-80C,D											
D	Cosmos 369	1970-81A	1970 Oct 8.63 106.20 days 1971 Jan 22.83	Ellipsoid 400?	1.8 long 1.2 dia	1970 Oct 9.6	70.93	92.32	6766	269	506	0.018	86
D	Cosmos 369 rocket	1970-81B	1970 Oct 8.63 52.76 days 1970 Nov 30.39	Cylinder 1500?	8 long 1.65 dia	1970 Oct 10.9	70.93	92.15	6757	271	486	0.016	84

*1970-80E ejected from 1970-80A on 1970 Oct 13

[+]1970-79B and 79C attached to 1970-79A until orbit change

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 370†	1970-82A	1970 Oct 9.46 12.84 days 1970 Oct 22.30	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1970 Oct 10.9	64.92	89.40	6623	202	288	0.006	33
D	Cosmos 370 rocket	1970-82B	1970 Oct 9.46 4.13 days 1970 Oct 13.59	Cylinder 2500?	7.5 long 2.6 dia	1970 Oct 11.7	64.93	88.77	6592	187	241	0.004	9
D	Cosmos 370 engine*	1970-82C	1970 Oct 9.46 18 days 1970 Oct 27	Cone 600? full	1.5 long? 2 dia?	1970 Oct 22.3	64.92	88.74	6591	182	243	0.005	-
	Cosmos 371	1970-83A	1970 Oct 12.58 100 years	Cylinder + paddles? 750?	2 long? 1 dia?	1970 Oct 31.0	74.00	99.92	7132	750	758	0.0005	16
	Cosmos 371 rocket	1970-83B	1970 Oct 12.58 80 years	Cylinder 2200?	7.4 long 2.4 dia	1970 Oct 12.9	74.00	99.81	7127	743	755	0.0009	107
D	Intercosmos 4	1970-84A	1970 Oct 14.48 95.20 days 1971 Jan 17.68	Ellipsoid + 6 panels 400?	1.8 long 1.2 dia	1970 Oct 16.9	48.41	93.56	6830	255	649	0.029	118
D	Intercosmos 4 rocket	1970-84B	1970 Oct 14.48 63.63 days 1970 Dec 17.11	Cylinder 1500?	8 long 1.65 dia	1970 Oct 16.7	48.41	93.29	6817	259	619	0.026	117
	Meteor 6	1970-85A	1970 Oct 15.48 60 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1970 Oct 25.1	81.21	97.49	7015	626	648	0.002	56
	Meteor 6 rocket	1970-85B	1970 Oct 15.48 60 years	Cylinder 1440	3.8 long 2.6 dia	1970 Oct 22.3	81.23	97.62	7022	551	736	0.013	155
	Fragment	1970-85C											

*1970-82C ejected from 1970-82A on 1970 Oct 21 or 22.

†Manoeuvrable

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 372	1970-86A	1970 Oct 16.63 100 years	Cylinder + paddles? 750?	2 long? 1 dia?	1970 Oct 29.2	74.06	100.80	7174	785	806	0.001	9
	Cosmos 372 rocket	1970-86B	1970 Oct 16.63 80 years	Cylinder 2200?	7.4 long 2.4 dia	1970 Oct 29.2	74.06	100.70	7169	776	806	0.002	7
	Fragments	1970-86C, D											
	Cosmos 373	1970-87A	1970 Oct 20.24 10 years	Cylinder?	4 long? 2 dia?	1970 Oct 20.5 1970 Oct 31.1	62.93 62.92	94.77 94.83	6886 6889	472 466	544 556	0.005 0.006	290 311
D	Cosmos 373 rocket	1970-87B	1970 Oct 20.24 90 days 1971 Jan 18	Cylinder 1500?	8 long? 2.5 dia?	1970 Oct 23.2	62.26	95.45	6919	145	937	0.057	54
D	Zond 8 launcher rocket	1970-88B	1970 Oct 20.83 6 days 1970 Oct 26	Cylinder 4000?	12 long? 4 dia	1970 Oct 21.6	51.51	88.68	6591	202	223	0.002	338
	Cosmos 374*	1970-89A	1970 Oct 23.18 150 years	Cylinder?	4 long? 2 dia?	1970 Oct 30.2	62.95	112.26	7709	521	2141	0.105	61
	Cosmos 374 rocket	1970-89B	1970 Oct 23.18 100 years	Cylinder 1500?	8 long? 2.5 dia?	1970 Oct 28.5	62.93	111.83	7690	517	2106	0.103	62
21d	Fragments	1970-89C-CU											
D	[Titan 3B Agena D]	1970-90A	1970 Oct 23.74 19 days 1970 Nov 11	Cylinder 3000?	8 long? 1.5 dia	1970 Oct 24.3	111.06	89.83	6644	135	396	0.020	137

Space Vehicle: Zond 8, 1970-88A, passed 1120 km beyond Moon on Oct 24.1; recovered on Earth Oct 27.58

*1970-89A passed close to 1970-87A on Oct 23.34, then exploded.

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 375*	1970-91A	1970 Oct 30.09 150 years	Cylinder?	4 long? 2 dia?	1970 Nov 3.0	62.82	111.82	7689	524	2098	0.102	56
	Cosmos 375 rocket	1970-91B	1970 Oct 30.09 100 years	Cylinder 1500?	8 long? 2.5 dia?	1970 Nov 3.9	62.78	111.52	7674	526	2066	0.100	56
3d	Fragments	1970-91C-AQ											
D	Cosmos 376	1970-92A	1970 Oct 30.56 12.71 days 1970 Nov 12.27	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1970 Oct 31.9 1970 Nov 10.3	65.38 65.42	89.43 89.23	6625 6616	207 203	286 272	0.006 0.005	73 65
R													
D	Cosmos 376 rocket	1970-92B	1970 Oct 30.56 5.61 days 1970 Nov 5.17	Cylinder 2500?	7.5 long 2.6 dia	1970 Oct 31.8	65.40	89.22	6614	209	263	0.004	62
D	Cosmos 376 engine**	1970-92C	1970 Oct 30.56 21 days 1970 Nov 20	Cone 600? full	1.5 long? 2 dia?	1970 Nov 15.6	65.36	88.67	6588	192	228	0.003	70
	IMEWS 1† [Titan 3C]	1970-93A	1970 Nov 6.44 1 million years	Cylinder + 4 panels 820?	6 long? 2.5 dia?	1970 Nov 7.1 1970 Dec 1.0	26.29 7.8	635.1 1197.1	24473 37346	300 26050	35890 35886	0.727 0.132	180 -
	Transtage	1970-93B	1970 Nov 6.44 million years	Cylinder 1500?	6 long? 3 dia				Orbit similar to 1970-93A				
D	Titan 3C second stage	1970-93C	1970 Nov 6.44 1.51 days 1970 Nov 7.95	Cylinder 1900	6 long 3.0 dia	1970 Nov 7.1	28.6	89.15	6617	147	331	0.014	120

* 1970-91A passed close to 1970-87A on Oct 30.25.

** Engine probably ejected about Nov 10.

† Integrated Missile Early Warning Satellite.

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Orbiting Frog Otolith 1 [Scout]	1970-94A	1970 Nov 9.25 180.96 days 1971 May 9.21	Octagonal cylinder 133	1.19 long 0.76 dia	1970 Nov 11.1 1971 Feb 1.0	37.41 37.41	92.64 91.86	6789 6750	304 278	518 466	0.016 0.014	134 -
D	Radiation Meteoroid - OFO 1 rocket	1970-94B	1970 Nov 9.25 90.15 days 1971 Feb 7.40	Cylinder 45 (payload 21)	1.68 long 0.76 dia	1970 Nov 11.1	37.41	92.71	6793	303	526	0.016	133
D	Fragments	1970-94C-E											
D	Luna 17 launcher rocket	1970-95B	1970 Nov 10.61 2.96 days 1970 Nov 13.57	Cylinder 4000?	12 long? 4 dia	1970 Nov 11.5	51.53	88.57	6584	184	228	0.003	299
D	Luna 17 launcher	1970-95C	1970 Nov 10.61 3.00 days 1970 Nov 13.61	-	-	1970 Nov 10.8	51.55	88.73	6593	192	237	0.003	296
D R	Cosmos 377	1970-96A	1970 Nov 11.39 11.9 days 1970 Nov 23.3	Sphere-cylinder 5700?	5.0 long 2.4 dia	1970 Nov 11.8	64.99	89.40	6623	204	286	0.006	44
D	Cosmos 377 rocket	1970-96B	1970 Nov 11.39 5.49 days 1970 Nov 16.88	Cylinder 2500?	7.5 long 2.6 dia	1970 Nov 11.4	64.98	89.36	6621	201	285	0.006	39
D	Cosmos 378*	1970-97A	1970 Nov 17.77 638.86 days 1972 Aug 17.63	Octagonal ellipsoid? 400?	1.8 long? 1.5 dia?	1970 Nov 20.0 1971 Oct 16.5	74.00 74.00	104.88 99.95	7366 7133	234 227	1742 1283	0.102 0.074	122 -
D	Cosmos 378 rocket	1970-97B	1970 Nov 17.77 682.98 days 1972 Sep 30.75	Cylinder 2200?	7.4 long 2.4 dia	1970 Nov 20.0 1971 Nov 16.0	74.00 74.00	104.75 99.99	7360 7135	233 222	1730 1292	0.102 0.075	121 -

Space Vehicle: Luna 17, 1970-95A

* Ionospheric studies

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	[Thorad Agena D]	1970-98A	1970 Nov 18.89 22.78 days 1970 Dec 11.67	Cylinder 2000?	8 long? 1.5 dia	1970 Nov 21.0	82.99	88.70	6587	185	232	0.004	164
D	Capsule*	1970-98B	1970 Nov 18.89 2492 days 1977 Sep 14	Octagon? 60?	0.3 long? 0.9 dia?	1970 Nov 20.6 1972 Sep 1.0	83.18 83.18	94.63 93.95	6877 6844	487 455	511 477	0.002 0.002	258 -
	Cosmos 379	1970-99A	1970 Nov 24.22 11 years	-	-	1970 Nov 24.9 1970 Nov 25.9 1970 Nov 30.2 1973 Jun 1.0	51.62 51.62 51.69 51.70	88.67 98.73 259.64 225.2	6590 7078 13483 12262	192 190 175 174	232 1210 14035 11593	0.003 0.072 0.514 0.466	80 62 72 -
D	Cosmos 379 rocket	1970-99B	1970 Nov 24.22 2.34 days 1970 Nov 26.56	Cylinder 2500?	7.5 long 2.6 dia	1970 Nov 24.9	51.61	88.46	6580	189	214	0.002	59
D	Cosmos 379 platform	1970-99C	1970 Nov 24.22 81 days 1971 Feb 13	-	-	1970 Nov 27.4	51.52	98.58	7071	187	1198	0.071	67
D	Fragment	1970-99D											
D	Cosmos 380	1970-100A	1970 Nov 24.46 205.43 days 1971 Jun 17.89	Ellipsoid 400?	1.8 long 1.2 dia	1970 Nov 25.2 1971 Mar 1.0	81.95 81.95	102.15 98.39	7238 7059	199 195	1520 1167	0.091 0.069	73 -
D	Cosmos 380 rocket	1970-100B	1970 Nov 24.46 135.76 days 1971 Apr 9.22	Cylinder 1500?	8 long 1.65 dia	1970 Nov 25.8 1971 Feb 1.0	81.96 81.96	101.93 98.40	7227 7060	197 193	1501 1170	0.090 0.069	71 -

* 1970-98B ejected from 1970-98A on 1970 Nov 18.96.

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Molniya 1R	1970-101A	1970 Nov 27.66 1824 days 1975 Nov 25	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1970 Nov 29.2 1971 Jan 1.0 1973 Feb 1.0	65.48 65.49 65.50	707.09 717.81 717.73	26292 26557 26555	471 463 1379	39356 39895 38975	0.740 0.742 0.708	285 - -
D	Molniya 1R launcher rocket	1970-101B	1970 Nov 27.66 13.69 days 1970 Dec 11.35	Cylinder 2500?	7.5 long 2.6 dia	1970 Nov 28.8	65.42	90.61	6683	213	397	0.014	51
D	Molniya 1R launcher	1970-101C	1970 Nov 27.66 20.08 days 1970 Dec 17.74	Irregular	-	1970 Nov 29.5	65.39	91.02	6703	216	434	0.016	60
D	Molniya 1R rocket	1970-101D	1970 Nov 27.66 1862 days 1976 Jan 2	Cylinder 440	2.0 long 2.0 dia	1970 Nov 30.6 1973 Feb 1.0	65.41 65.46	702.99 702.97	26190 26190	412 1350	39212 38273	0.741 0.705	285 -
	Cosmos 381*	1970-102A	1970 Dec 2.17 1200 years	Cylinder + boom 700?	1.4 long 2.0 dia	1970 Dec 7.6	74.04	104.93	7369	968	1013	0.003	270
	Cosmos 381 rocket	1970-102B	1970 Dec 2.17 600 years	Cylinder 2200?	7.4 long 2.4 dia	1970 Dec 4.6	74.03	104.82	7364	967	1004	0.002	263
	Fragments	1970-102C-F											
	Cosmos 382	1970-103A	1970 Dec 2.69 1000 years	Sphere?	5 dia?	1970 Dec 4.5 1970 Dec 7.4 1970 Dec 8.0	51.54 51.55 55.87	142.82 158.93 171.06	9053 9722 10,208	305 1615 2577	5045 5072 5082	0.262 0.178 0.123	261 258 248
	Cosmos 382 rocket	1970-103B	1970 Dec 2.69 30000 years	Cylinder 4000?	12 long? 4 dia	1970 Dec 5.1 1971 Jan 1.0	51.53 51.54	144.07 158.74	9105 9714	409 1590	5045 5081	0.255 0.180	261 285
	Cosmos 382 platform	1970-103C	1970 Dec 2.69 30000 years	-	-	1970 Dec 14.4	51.59	159.07	9727	1614	5084	0.178	266
2d	Fragments	1970-103D-F											

* Topside ionospheric sounder

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 383*	1970-104A	1970 Dec 3.58	Sphere-cylinder	6.5 long?	1970 Dec 4.7	65.41	89.33	6620	204	279	0.006	57
R			12.69 days	6300?	2.4 dia	1970 Dec 14.1	65.42	89.53	6630	181	323	0.011	53
			1970 Dec 16.27										
D	Cosmos 383 rocket	1970-104B	1970 Dec 3.58	Cylinder	7.5 long	1970 Dec 4.4	65.40	89.15	6611	200	266	0.005	55
			6.12 days	2500?	2.6 dia								
			1970 Dec 9.70										
D	Cosmos 384	1970-105A	1970 Dec 10.47	Sphere-cylinder	5.9 long	1970 Dec 11.5	72.88	89.46	6626	203	292	0.007	57
R			11.80 days	5900?	2.4 dia								
			1970 Dec 22.27										
D	Cosmos 384 rocket	1970-105B	1970 Dec 10.47	Cylinder	7.5 long	1970 Dec 12.4	72.89	89.16	6610	195	268	0.005	41
			5.31 days	2500?	2.6 dia								
			1970 Dec 15.78										
D	Capsule**	1970-105E	1970 Dec 10.47	Ellipsoid	0.9 long	1970 Dec 18.3	72.88	89.27	6616	204	271	0.005	44
			17 days	200?	1.9 dia								
			1970 Dec 27										
D	Fragments	1970-105C,D											
	NOAA 1 † (ITOS)	1970-106A	1970 Dec 11.42	Box	1.25 long	1970 Dec 20.9	101.94	114.93	7829	1429	1473	0.003	237
			10000 years	306	1.02 square								
	NOAA 1 second stage (CEP 1)††	1970-106B	1970 Dec 11.48	Cylinder	4.9 long	1970 Dec 24.9	101.92	114.91	7828	1425	1475	0.003	226
			5000 years	350?	1.43 dia								
	Fragment	1970-106C											

* Cosmos 383 manoeuvred, but the jettisoned engine was apparently not tracked or designated.

** 1970-105E ejected from 1970-105A on 1970 Dec 17.6

† National Oceanic and Atmospheric Administration

†† Cylindrical Electrostatic Probe

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Explorer 42 (SAS 1)*	1970-107A	1970 Dec 12.45 20 years	Cylinder + 4 paddles 143	1.16 long 0.56 dia	1970 Dec 12.7	3.04	95.30	6921	522	563	0.003	0
	Explorer 42 rocket	1970-107B	1970 Dec 12.45 9 years	Cylinder 24	1.50 long 0.46 dia	1970 Dec 12.4	2.91	95.22	6917	529	549	0.002	352
	Cosmos 385	1970-108A	1970 Dec 12.54 1200 years	Cylinder + boom? 700?	1.4 long 2.0 dia	1970 Dec 15.9	74.02	104.75	7360	978	986	0.0005	312
	Cosmos 385 rocket	1970-108B	1970 Dec 12.54 600 years	Cylinder 2200?	7.4 long 2.4 dia	1970 Dec 15.3	74.02	104.64	7355	974	979	0.0003	129
L	Peole 1**	1970-109A	1970 Dec 12.54 20 years	Octahedron 70	0.55 long 0.70 dia	1971 Jan 12.8	15.00	97.17	7010	517	747	0.016	248
	Peole 1 rocket	1970-109B	1970 Dec 12.54 50 years	Cylinder 68	1.60 long? 0.65 dia	1970 Dec 24.7	15.00	98.43	7070	635	749	0.008	319
1d	Fragments	1970-109C-F											

* Small Astronomical Satellite. ** Préliminaire à Eole

Year of launch 1970 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 386†	1970-110A	1970 Dec 15.42 12.9 days 1970 Dec 28.3	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1970 Dec 16.5	64.99	89.40	6624	215	276	0.005	52
D	Cosmos 386 rocket	1970-110B	1970 Dec 15.42 3.88 days 1970 Dec 19.30	Cylinder 2500?	7.5 long 2.6 dia	1970 Dec 16.2	65.01	88.91	6599	196	245	0.004	8
D	Cosmos 386 engine*	1970-110E	1970 Dec 15.42 19 days 1971 Jan 3	Cone 600? full	1.5 long? 2 dia?	1970 Dec 29.6	64.99	89.77	6642	213	315	0.008	40
D	Fragments	1970-110C,D,F											
	Cosmos 387	1970-111A	1970 Dec 16.19 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1970 Dec 24.0	74.01	95.31	6911	528	538	0.0008	6
	Cosmos 387 rocket	1970-111B	1970 Dec 16.19 10 years	Cylinder 2200?	7.4 long 2.4 dia	1970 Dec 24.0	74.01	95.13	6902	513	535	0.002	31
D	Fragments	1970-111C-E											
D	Cosmos 388	1970-112A	1970 Dec 18.40 143.40 days 1971 May 10.80	Ellipsoid 400?	1.8 long 1.2 dia	1970 Dec 20.3 1971 Mar 1.0	70.95 70.95	92.32 91.51	6766 6726	271 257	505 439	0.017 0.014	78 -
D	Cosmos 388 rocket	1970-112B	1970 Dec 18.40 61.35 days 1971 Feb 17.75	Cylinder 1500?	8 long 1.65 dia	1970 Dec 20.4	70.96	92.18	6759	268	494	0.017	79

*1970-110E ejected from 1970-110A about 1970 Dec 28.

† Manoeuvrable

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 389	1970-113A	1970 Dec 18.68 60 years	Cylinder + 2 vanes 2500?	5 long? 1.5 dia?	1970 Dec 25.3	81.19	98.06	7043	642	687	0.003	270
	Cosmos 389 rocket	1970-113B	1970 Dec 18.68 60 years	Cylinder 1440	3.8 long 2.6 dia	1970 Dec 29.7	81.20	98.08	7044	602	729	0.009	172
D	Fragment	1970-113C											
D	Molniya 1S	1970-114A	1970 Dec 25.16 31 months 1973 Jul	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1970 Dec 28.7 1971 Feb 1.0 1972 Jul 1.0	64.99 64.99 65.00	711.80 717.75 720.96	26408 26556 26635	495 474 429	39565 39881 40085	0.740 0.742 0.744	285 - -
D	Molniya 1S launcher rocket	1970-114B	1970 Dec 25.16 29 days 1971 Jan 23	Cylinder 2500?	7.5 long 2.6 dia	1970 Dec 26.7	65.01	91.10	6707	230	428	0.015	63
D	Molniya 1S launcher	1970-114C	1970 Dec 25.16 47.12 days 1971 Feb 10.28	Irregular	-	1970 Dec 28.5	64.98	91.65	6734	240	472	0.017	70
D	Molniya 1S rocket	1970-114F	1970 Dec 25.16 799 days 1973 Mar 3	Cylinder 440	2.0 long 2.0 dia	1971 Jan 3.6 1971 Sep 1.0 1972 Jun 1.0	65.02 64.99 65.02	709.66 709.66 709.48	26356 26356 26351	366 500 327	39589 39455 39619	0.744 0.739 0.745	285 - -
D	Fragments	1970-114D,E,G											

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 390 †	1971-01A	1971 Jan 12.40 12.83 days 1971 Jan 25.23	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1971 Jan 14.1	65.01	89.28	6618	204	275	0.005	49
D	Cosmos 390 rocket	1971-01B	1971 Jan 12.40 5.05 days 1971 Jan 17.45	Cylinder 2500?	7.5 long 2.6 dia	1971 Jan 13.2	65.02	89.13	6610	202	262	0.004	44
D	Cosmos 390 engine*	1971-01C	1971 Jan 12.40 20 days 1971 Feb 1	Cone 600? full	1.5 long? 2 dia?	1971 Jan 23.8	65.02	89.06	6607	204	253	0.004	61
D	Fragments	1971-01D-F											
D	Cosmos 391	1971-02A	1971 Jan 14.50 402.57 days 1972 Feb 21.07	Ellipsoid 400?	1.8 long 1.2 dia	1971 Jan 15.5 1971 Aug 1.0	70.91 70.91	95.31 93.54	6913 6827	267 256	803 641	0.039 0.028	86 -
D	Cosmos 391 rocket	1971-02B	1971 Jan 14.50 218.62 days 1971 Aug 21.12	Cylinder 1500?	8 long 1.65 dia	1971 Jan 15.8 1971 May 1.0	70.92 70.92	95.20 93.33	6908 6816	267 253	792 623	0.038 0.027	86 -
	Meteor 7	1971-03A	1971 Jan 20.48 60 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1971 Feb 1.0	81.21	97.60	7021	629	656	0.002	5
	Meteor 7 rocket	1971-03B	1971 Jan 20.48 60 years	Cylinder 1440	3.8 long 2.6 dia	1971 Jan 28.6	81.22	97.76	7029	564	737	0.012	139
1d	Fragments**	1971-00A-E											

*1971-01C ejected from 1971-01A about 1971 Jan 23.7. † Manoeuvrable

**These unidentified fragments were discovered in orbit, and catalogued on 1971 Feb 9 (A,B,C) and 1971 Jun 30 (D,E). 1971-00D decayed 1973 Jun 26.

Year of launch 1971, continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 392	1971-04A	1971 Jan 21.38 11.83 days 1971 Feb 2.19	Sphere-cylinder 5700?	5.0 long 2.4 dia	1971 Jan 23.2	64.99	89.32	6619	204	278	0.006	45
D	Cosmos 392 rocket	1971-04B	1971 Jan 21.36 5 days 1971 Jan 26	Cylinder 2500?	7.5 long 2.6 dia	1971 Jan 22.4	65.00	89.17	6612	198	270	0.005	20
D	[Titan 3B Agena D]	1971-05A	1971 Jan 21.77 19 days 1971 Feb 9	Cylinder 3000?	8 long? 1.5 dia	1971 Jan 21.9	110.86	90.09	6657	139	418	0.021	144
D	Fragments	1971-05B,C											
	Intelsat 4A (F-2)	1971-06A	1971 Jan 26.03 > million years	Cylinder 1410 full 707 empty	2.82 long 2.39 dia	1971 Jan 26.1 1971 Feb 17.2 1971 Apr 1.0	28.25 0.55 0.55	638.7 1450.8 1436.1	24553 42453 42165	548 35801 35779	35801 36349 35794	0.718 0.006 0.0002	179 59 -
	Intelsat 4A rocket	1971-06B	1971 Jan 26.03 7000 years	Cylinder 1815	8.6 long 3.0 dia	1971 Feb 4.3	28.20	654.5	24966	597	36578	0.721	184
D	Cosmos 393	1971-07A	1971 Jan 26.53 140.86 days 1971 Jun 16.39	Ellipsoid 400?	1.8 long 1.2 dia	1971 Jan 28.4 1971 Apr 1.0	71.03 71.03	92.13 91.29	6757 6716	272 257	485 418	0.016 0.012	77 -
D	Cosmos 393 rocket	1971-07B	1971 Jan 26.53 63.81 days 1971 Mar 31.34	Cylinder 1500?	8 long 1.65 dia	1971 Jan 27.9	71.03	92.03	6752	271	476	0.015	82

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Apollo 14**	1971-08A	1971 Jan 31.88	Cone-	11.15 long	1971 Jan 31.9	32.56	88.07	6564	186	186	0	- *
3M			9.00 days	cylinder	3.91 dia	1971 Feb 1.1	33.2	26320	292520	200	572080	0.977	30 *
R			1971 Feb 9.88	29229 initially		In selenocentric orbit 1971 Feb 4.29 to Feb 7.07							
D	Saturn IV B [Saturn 509]	1971-08B	1971 Jan 31.88	Cylinder	18.7 long	1971 Jan 31.9	32.56	88.07	6564	186	186	0	- *
			3.44 days	13990	6.6 dia	1971 Feb 1.1	33.2	26320	292520	200	572080	0.977	30 *
			1971 Feb 4.32			Crashed on Moon 1971 Feb 4.32							
D	LEM 8 descent stage	1971-08D	1971 Jan 31.88	Octagon +	1.57 high	1971 Feb 1.1	33.2	26320	292520	200	572080	0.977	30 *
			4.51 days	4 legs	3.13 wide	Entered selenocentric orbit 1971 Feb 4.29							
			1971 Feb 5.39	10420 full 2139 empty		Landed on Moon 1971 Feb 5.39							
D	LEM 8† ascent stage	1971-08C	1971 Jan 31.88	Box + tanks	2.52 high	1971 Feb 1.1	33.2	26320	292520	200	572080	0.977	30 *
			6.15 days	4857 full	3.76 wide	On Moon's surface 1971 Feb 5.39 to Feb 6.78							
			1971 Feb 7.03	2128 empty	3.13 deep	Finally crashed on Moon 1971 Feb 7.03							
	NATO 2	1971-09A	1971 Feb 3.07	Cylinder	0.81 long	1971 Feb 15.0	27.83	587.5	23238	299	33420	0.713	249 *
			> million years	243 full	1.37 dia	1971 Mar 15.0	2.8	1403.4	41523	34429	35860	0.017	- *
				129 empty		1975 May 1.0	0.8	1436.3	42168	35778	35802	0.0003	-
	NATO 2 rocket	1971-09B	1971 Feb 3.07	Sphere-cone	1.32 long	1971 Mar 1.0	25.9	665.0	25236	283	37433	0.736	-
			20 years	66	0.94 dia								
1d	Fragments	1971-09C,D											
	Cosmos 394	1971-10A	1971 Feb 9.79	Cylinder?	4 long?	1971 Feb 12.2	65.84	96.54	6971	572	614	0.003	352
			40 years		2 dia?								
	Cosmos 394 rocket	1971-10B	1971 Feb 9.79	Cylinder	7.4 long	1971 Feb 16.3	65.84	96.43	6966	564	612	0.003	357
			30 years	2200?	2.4 dia								
	Fragment	1971-10C											

*Approximate orbits.

**Apollo attached to LEM, separated from Saturn IVB on Feb 1.13.

† LEM with two crew members, separated from Apollo on Feb 5.20.
Ascent stage relaunched from Moon Feb 6.78; briefly docked with Apollo Feb 6.86.

Year of launch 1971, continued

Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
Tansei* [Mu 4S]	1971-11A	1971 Feb 16.17 1000 years	26-sided cylinder 62	0.83 long 0.71 dia	1971 Mar 1.7	29.66	105.95	7422	984	1103	0.008	219
Tansei rocket	1971-11B	1971 Feb 16.17 500 years	Sphere-cone 90?	1.86 long 0.79 dia	1971 May 1.0	29.66	104.74	7361	973	993	0.001	-
Fragment	1971-11C											
[Thor Burner 2]	1971-12A	1971 Feb 17.16 80 years	12-faced frustum 195	1.64 long 1.31 to 1.10 dia	1971 Feb 28.0	98.83	100.86	7176	763	833	0.005	327
Burner 2 rocket	1971-12B	1971 Feb 17.16 60 years	Sphere-cone 66	1.32 long 0.94 dia	1971 Feb 19.0	98.78	100.96	7181	779	827	0.003	0
Calsphere 3**	1971-12C	1971 Feb 17.16 25 years	Sphere (Aluminium) 0.73	0.26 dia	1971 Feb 28.0	98.84	100.89	7178	765	834	0.005	331
Calsphere 4	1971-12D	1971 Feb 17.16 25 years	Sphere (Aluminium) 0.73	0.26 dia	1971 Feb 19.0	98.84	100.86	7176	763	833	0.005	353
Calsphere 5	1971-12E	1971 Feb 17.16 25 years	Sphere (Gold) 0.73	0.26 dia	1971 Feb 27.9	98.82	100.95	7181	773	832	0.004	328
Cosmos 395	1971-13A	1971 Feb 17.88 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1971 Mar 2.3	74.04	95.41	6916	529	546	0.001	48
Cosmos 395 rocket	1971-13B	1971 Feb 17.88 10 years	Cylinder 2200?	7.4 long 2.4 dia	1971 Feb 25.4	74.03	95.30	6910	519	545	0.002	48
D Fragments	1971-13C-E											

*Japanese satellite.

** Calibration sphere.

Year of launch 1971, continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 396	1971-14A	1971 Feb 18.59 12.70 days 1971 Mar 3.29	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1971 Feb 20.4 1971 Feb 25.8	65.42 65.42	89.40 89.30	6624 6619	205 189	286 292	0.006 0.008	63 37
D	Cosmos 396 rocket	1971-14B	1971 Feb 18.59 6.98 days 1971 Feb 25.57	Cylinder 2500?	7.5 long 2.6 dia	1971 Feb 20.4	65.40	89.18	6613	206	263	0.004	61
D	Cosmos 396 engine*	1971-14E	1971 Feb 18.59 18 days 1971 Mar 8	Cone 600? full	1.5 long? 2 dia?	1971 Mar 3.4	65.42	89.00	6604	179	272	0.007	33
D	Fragments	1971-14C,D,F											
	Cosmos 397**	1971-15A	1971 Feb 25.47 150 years	Cylinder?	4 long? 2 dia?	1971 Mar 6.6	65.73	113.51	7766	574	2202	0.105	47
D	Cosmos 397 rocket	1971-15B	1971 Feb 25.47 6.78 days 1971 Mar 4.25	Cylinder 1500?	8 long? 2.5 dia?	1971 Feb 26.9	65.10	92.11	6757	144	613	0.035	53
5d	Fragments	1971-15C-CM											
	Cosmos 398	1971-16A	1971 Feb 26.22 20 years	-	-	1971 Feb 28.1 1971 Feb 28.4	51.61 51.59	88.86 216.13	6599 11931	189 203	252 10903	0.005 0.449	75 81
D	Cosmos 398 rocket	1971-16B	1971 Feb 26.22 3.12 days 1971 Mar 1.34	Cylinder 2500?	7.5 long 2.6 dia	1971 Feb 26.9	51.61	88.69	6591	186	239	0.004	58
D	Cosmos 398 platform	1971-16C	1971 Feb 26.22 75 days 1971 May 12	-	-	1971 Mar 6.8	51.60	98.47	7065	186	1188	0.071	89
D	Fragments	1971-16D,E											

*1971-14E ejected from 1971-14A about 1971 Mar 3.3.

**1971-15A passed close to 1971-10A about 1971 Feb 25.60, then exploded.

Year of launch 1971, continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 399	1971-17A	1971 Mar 3.40	Sphere-	6.5 long?	1971 Mar 4.6	65.00	89.34	6620	201	283	0.006	36
R			13.84 days	cylinder	2.4 dia	1971 Mar 10.9	64.99	90.86	6695	196	438	0.018	-
			1971 Mar 17.24	6300?									
D	Cosmos 399	1971-17B	1971 Mar 3.40	Cylinder	7.5 long	1971 Mar 4.4	65.01	89.14	6611	199	266	0.005	30
	rocket		5.09 days	2500?	2.6 dia								
			1971 Mar 8.49										
D	Cosmos 399	1971-17C	1971 Mar 3.40	Cone	1.5 long?	1971 Mar 15.6	64.99	90.70	6687	195	423	0.017	34
	engine*		22 days	600? full	2 dia?								
			1971 Mar 25										
D	Fragments	1971-17D,E											
	China 2**	1971-18A	1971 Mar 3.51	Spheroid?	1 dia?	1971 Mar 5.0	69.90	106.18	7427	268	1830	0.105	191
			8¼ years	221		1972 Oct 16.5	69.89	103.88	7320	262	1622	0.093	-
D	China 2	1971-18B	1971 Mar 3.51	Cylinder	-	1971 Mar 13.5	69.91	106.10	7423	265	1825	0.105	180
	rocket		1811 days			1972 Mar 1.0	69.89	103.82	7317	267	1611	0.092	-
			1976 Feb 16			1973 Nov 1.0	69.89	99.26	7099	256	1186	0.065	-
D	Explorer 43	1971-19A	1971 Mar 13.68	16-sided	1.82 long	1971 Mar 17.8	28.80	5956.1	108843	353	204577	0.938	303
	(Imp 8)		1299 days	cylinder	1.36 dia	1973 Jan 1.0	39.90	5979.5	109128	13755	191745	0.815	-
			1974 Oct 2	288									
D	Explorer 43	1971-19B	1971 Mar 13.68	Cylinder	4.9 long	1971 Mar 13.8	28.74	92.22	6768	237	543	0.023	297
	second stage		70.25 days	350	1.43 dia								
			1971 May 22.93										
D	Explorer 43	1971-19C	1971 Mar 13.68	Sphere-cone	1.32 long	1971 Mar 13.7	28.75	5628	104783	235	196575	0.937	303
	third stage		43 months?	66	0.94 dia								
			1974 Oct?										
D	Fragments	1971-19D,E											

* 1971-17C ejected from 1971-17A about 1971 Mar 15.2.

**1971-18A and 1971-18B were probably joined until 1971 Mar 11.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 400	1971-20A	1971 Mar 18.91 1200 years	Cylinder?	4 long? 2 dia?	1971 Mar 20.3	65.83	104.99	7373	983	1006	0.002	267
	Cosmos 400 rocket	1971-20B	1971 Mar 18.91 600 years	Cylinder 2200?	7.4 long 2.4 dia	1971 Mar 27.9	65.82	104.88	7367	983	995	0.001	250
	Fragment	1971-20C											
	SDS-A† [Titan 3B Agena D]	1971-21A	1971 Mar 21.16 12 years?	Cylinder?	-	1971 Mar 21.4	63.19	596.7	23473	390	33800	0.711	-
	SDS-A rocket	1971-21B	1971 Mar 21.16 12 years?	Cylinder 700?	6 long? 1.5 dia	1971 May 19.6 1973 Dec 1.0 1975 Jan 1.0	63.19 63.0 63.02	700.5 700.1 700.1	26128 26118 26120	310 1148 931	39190 38332 38552	0.744 0.712 0.720	270 - -
D	[Thorad Agena D]	1971-22A	1971 Mar 24.88 18.81 days 1971 Apr 12.69	Cylinder 2000?	8 long? 1.5 dia	1971 Mar 25.5	81.52	88.56	6580	157	246	0.007	136
D	Cosmos 401	1971-23A	1971 Mar 27.46	Sphere- cylinder 6300?	6.5 long? 2.4 dia	1971 Mar 31.1	72.83	89.26	6616	185	290	0.008	45
R			12.81 days 1971 Apr 9.27			1971 Apr 2.4 1971 Apr 3.7	72.84 72.83	89.85 90.40	6645 6672	185 186	348 401	0.012 0.016	49 50
D	Cosmos 401 rocket	1971-23B	1971 Mar 27.46 5.94 days 1971 Apr 2.40	Cylinder 2500?	7.5 long 2.6 dia	1971 Mar 28.7	72.84	89.31	6618	197	283	0.006	47
D	Cosmos 401 engine*	1971-23C	1971 Mar 27.46 20 days 1971 Apr 16	Cone 600? full	1.5 long? 2 dia?	1971 Apr 8.7	72.83	90.26	6665	183	390	0.015	39
D	Fragments	1971-23D,E											

*1971-23C ejected from 1971-23A about 1971 Apr 8.4.

† Satellite Data System.

Year of launch 1971, continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Isis 2	1971-24A	1971 Apr 1.12 8000 years	Polyhedron 264	1.22 long 1.27 dia	1971 Apr 9.9	88.15	113.67	7772	1358	1429	0.005	120
	Isis 2 rocket	1971-24B	1971 Apr 1.12 5000 years	Cylinder 24	1.50 long 0.46 dia	1971 Apr 4.1	88.16	113.63	7770	1355	1428	0.005	129
	Fragment	1971-24C											
	Cosmos 402 †	1971-25A	1971 Apr 1.48 600 years	Cone-cylinder	6 long? 2 dia?	1971 Apr 1.5 1971 Apr 9.6	64.97 64.98	89.71 104.94	6639 7370	247 948	274 1036	0.002 0.008	231 264
D	Cosmos 402 platform	1971-25B	1971 Apr 1.48 35.10 days 1971 May 6.58	Irregular	-	1971 Apr 3.6	64.97	89.59	6633	247	263	0.001	229
D	Cosmos 402 rocket	1971-25C	1971 Apr 1.48 5 days 1971 Apr 6	Cylinder 1500?	8 long? 2.5 dia?	1971 Apr 2.3	64.96	89.46	6627	239	258	0.001	271
D	Fragment	1971-25D											
D R	Cosmos 403	1971-26A	1971 Apr 2.35 11.8 days 1971 Apr 14.2	Sphere-cylinder 5700?	5.0 long 2.4 dia	1971 Apr 4.1	81.34	88.96	6600	214	230	0.001	1
D	Cosmos 403 rocket	1971-26B	1971 Apr 2.35 3.27 days 1971 Apr 5.62	Cylinder 2500?	7.5 long 2.6 dia	1971 Apr 3.1	81.33	88.81	6593	201	228	0.002	346
D	Cosmos 404*	1971-27A	1971 Apr 4.60 <0.4 day ? 1971 Apr 4?	Cylinder?	4 long? 2 dia?	1971 Apr 4.7 1971 Apr 5.4	65.74 65.15	103.12 94.22	7284 6862	802 169	1010 799	0.014 0.046	245 50
D	Cosmos 404 rocket	1971-27B	1971 Apr 4.60 7.44 days 1971 Apr 12.04	Cylinder 1500?	8 long? 2.5 dia?	1971 Apr 5.6	65.08	92.34	6768	148	632	0.036	53
D	Fragments	1971-27C,D											

*Cosmos 404 passed close to Cosmos 400 about 1971 Apr 4.63, then de-orbited over ocean?

† 1971-25B and 25C attached to 1971-25A until orbit change.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 405	1971-28A	1971 Apr 7.30 60 years	Cylinder + 2 vanes 2500?	5 long? 1.5 dia?	1971 Apr 8.0	81.24	98.33	7056	673	683	0.001	139
	Cosmos 405 rocket	1971-28B	1971 Apr 7.30 60 years	Cylinder 1440	3.8 long 2.6 dia	1971 Apr 10.3	81.25	98.43	7061	616	749	0.009	180
1d	Fragments	1971-28C,D											
D R	Cosmos 406 †	1971-29A	1971 Apr 14.34 9.9 days 1971 Apr 24.2	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1971 Apr 14.4	81.31	89.16	6610	217	246	0.002	33
D	Cosmos 406 rocket	1971-29B	1971 Apr 14.34 3.62 days 1971 Apr 17.96	Cylinder 2500?	7.5 long 2.6 dia	1971 Apr 14.7	81.32	89.02	6603	211	238	0.002	20
D	Cosmos 406 engine*	1971-29E	1971 Apr 14.34 14 days 1971 Apr 28	Cone 600? full	1.5 long? 2 dia?	1971 Apr 25.8	81.31	88.31	6568	184	195	0.001	-
D	Fragments	1971-29C,D,F											
	Tournesol 1 [Diamant B]	1971-30A	1971 Apr 15.40 10 years	Cylinder + 4 vanes 96	0.80 long 0.70 dia	1971 Apr 19.5	46.37	96.16	6955	457	697	0.017	63
	Tournesol 1 rocket	1971-30B	1971 Apr 15.40 8¼ years	Cylinder 68	1.60 long? 0.65 dia	1971 Apr 20.9	46.38	96.09	6952	448	699	0.018	67
D	Fragments	1971-30C-H											

* 1971-29E ejected from 1971-29A on 1971 Apr 22.

† Manoeuvrable

Year of launch 1971, continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Meteor 8	1971-31A	1971 Apr 17.49 60 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1971 Apr 18.9	81.24	97.17	7000	610	633	0.002	280
	Meteor 8 rocket	1971-31B	1971 Apr 17.49 60 years	Cylinder 1440	3.8 long 2.6 dia	1971 Apr 19.6	81.24	97.36	7009	554	708	0.011	177
D	Salyut 1*	1971-32A	1971 Apr 19.07 175 days 1971 Oct 11	Cylinder + 4 wings 18500	14 long 4.15 max dia 2.0 min dia	1971 Apr 20.1 1971 Apr 28.8	51.56 51.57	88.53 89.67	6583 6639	200 251	210 271	0.0008 0.0014	341 188
D	Salyut 1 rocket	1971-32B	1971 Apr 19.07 1 day 1971 Apr 20	Cylinder 4000?	12 long? 4 dia	1971 Apr 19.4	51.55	88.30	6572	176	211	0.003	269
D	Fragments	1971-32C-G											
D	[Titan 3B Agena D]	1971-33A	1971 Apr 22.65 21 days 1971 May 13	Cylinder 3000?	8 long? 1.5 dia	1971 Apr 23.2	110.93	89.85	6645	132	401	0.020	127
D 3M R	Soyuz 10**	1971-34A	1971 Apr 23.00 1.99 days 1971 Apr 24.99	Sphere-cylinder + 2 wings. 6575?	7.5 long 2.2 dia	1971 Apr 23.7 1971 Apr 24.4	51.60 51.56	89.11 88.65	6612 6589	209 190	258 231	0.004 0.003	102 119
D	Soyuz 10 rocket	1971-34B	1971 Apr 23.00 2.74 days 1971 Apr 25.74	Cylinder 2500?	7.5 long 2.6 dia	1971 Apr 24.2	51.59	88.42	6578	194	205	0.0008	37
	Cosmos 407	1971-35A	1971 Apr 23.48 120 years	Cylinder + paddles 750?	2 long? 1 dia?	1971 Apr 28.6	74.06	100.99	7183	791	819	0.002	83
	Cosmos 407 rocket	1971-35B	1971 Apr 23.48 100 years	Cylinder 2200?	7.4 long 2.4 dia	1971 Apr 27.5	74.06	100.90	7179	783	818	0.002	74
	Fragments	1971-35C-G											

* De-orbited over Pacific Ocean.

**Soyuz 10 docked with Salyut 1 from Apr 24.07 to Apr 24.30.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	San Marco 3	1971-36A	1971 Apr 24.31 218.88 days 1971 Nov 29.19	Sphere 164	0.76 dia	1971 Apr 28.0 1971 Sep 1.0	3.23 3.23	93.82 92.17	6848 6766	222 214	718 562	0.036 0.026	4 -
D	San Marco 3 rocket	1971-36B	1971 Apr 24.31 42 days 1971 Jun 5	Cylinder 24	1.50 long 0.46 dia	1971 May 3.0	3.25	93.42	6828	209	691	0.035	-*
D	Cosmos 408	1971-37A	1971 Apr 24.47 248.80 days 1971 Dec 29.27	Ellipsoid 400?	1.8 long 1.2 dia	1971 Apr 25.2 1971 Aug 31.7	81.83 81.83	102.10 97.68	7235 7024	200 194	1514 1098	0.091 0.064	72 -
D	Cosmos 408 rocket	1971-37B	1971 Apr 24.47 158.23 days 1971 Sep 29.70	Cylinder 1500?	8 long 1.65 dia	1971 Apr 25.9 1971 Jul 16.5	81.83 81.83	101.89 97.95	7225 7038	201 194	1493 1125	0.089 0.066	70 -
	Cosmos 409	1971-38A	1971 Apr 28.61 3000 years	Spheroid + paddles? 650?	1.6 dia?	1971 May 2.3	74.01	109.36	7575	1177	1216	0.003	218
	Cosmos 409 rocket	1971-38B	1971 Apr 28.61 2000 years	Cylinder 2200?	7.4 long 2.4 dia	1971 Apr 30.9	74.00	109.23	7569	1173	1208	0.002	204
	IMEWS 2 [Titan 3C]	1971-39A	1971 May 5.33 >million years	Cylinder + 4 panels 820?	6 long? 2.5 dia?	1971 May 5.3 1971 Jun 1.0	26.36 0.87	630.95 1434.0	24419 42124	295 35651	35787 35840	0.727 0.002	180 -
	Transtage	1971-39B	1971 May 5.33 >million years	Cylinder 1500?	6 long? 3 dia	1971 May 5.3 1971 Jun 1.0	26.36 0.87	630.95 1434.0	24419 42124	295 35651	35787 35840	0.727 0.002	180 -
D	Titan 3C second stage	1971-39C	1971 May 5.33 1 day 1971 May 6	Cylinder 1900	6 long 3.0 dia	1971 May 5.3	28.5	89.91	6655	148	406	0.019	114

*Approximate orbit.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 410	1971-40A	1971 May 6.27 11.90 days 1971 May 18.17	Sphere-cylinder 5900?	5.9 long 2.4 dia	1971 May 7.4	64.96	89.35	6621	205	280	0.006	43
D	Cosmos 410 rocket	1971-40B	1971 May 6.27 5.19 days 1971 May 11.46	Cylinder 2500?	7.5 long 2.6 dia	1971 May 6.8	64.96	89.21	6614	202	270	0.005	37
D	Excess Radiation Package A*	1971-40C	1971 May 6.27 19 days 1971 May 25	Ellipsoid 200?	0.9 long 1.9 dia	1971 May 17.7	64.95	89.11	6609	197	264	0.005	36
D	Fragment	1971-40D											
	Cosmos 411	1971-41A	1971 May 7.60 5000 years	Spheroid 40?	1.0 long? 0.8 dia?	1971 May 10.0	74.03	113.91	7783	1318	1492	0.011	100
	Cosmos 412	1971-41B	1971 May 7.60 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1971 May 11.3	74.04	116.20	7888	1482	1537	0.003	219
	Cosmos 413	1971-41C	1971 May 7.60 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1971 May 8.6	74.04	115.84	7871	1476	1509	0.002	205
	Cosmos 414	1971-41D	1971 May 7.60 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1971 May 9.9	74.02	115.16	7840	1428	1496	0.004	123
	Cosmos 415	1971-41E	1971 May 7.60 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1971 May 10.9	74.01	115.50	7856	1452	1503	0.003	145
	Cosmos 416	1971-41F	1971 May 7.60 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1971 May 11.3	74.02	114.54	7812	1373	1494	0.008	105

*1971-40C ejected from 1971-40A on 1971 May 17.

1971-41 continued on page 260

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 417	1971-41G	1971 May 7.60 6000 years	Spheroid 40?	1.0 long? 0.8 dia?	1971 May 10.0	74.01	114.23	7798	1344	1495	0.010	106
	Cosmos 418	1971-41H	1971 May 7.60 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1971 May 11.2	74.01	114.85	7826	1401	1495	0.006	111
	Cosmos 411 rocket	1971-41J	1971 May 7.60 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1971 May 9.9	74.04	116.87	7918	1487	1592	0.007	237
D	Cosmos 419*	1971-42A	1971 May 10.71 2.13 days 1971 May 12.84	Cone- cylinder? 23400? full	16 long? 4 dia	1971 May 11.6	51.53	87.47	6530	145	159	0.001	297
D R	Cosmos 420 †	1971-43A	1971 May 18.34 10.93 days 1971 May 29.27	Sphere- cylinder 6300?	6.5 long? 2.4 dia	1971 May 19.5	51.75	89.00	6606	199	257	0.004	21
D	Cosmos 420 rocket	1971-43B	1971 May 18.34 2.72 days 1971 May 21.06	Cylinder 2500?	7.5 long 2.6 dia	1971 May 19.0	51.79	88.60	6586	186	230	0.003	353
D	Cosmos 420 engine **	1971-43C	1971 May 18.34 16 days 1971 Jun 3	Cone 600? full	1.5 long? 2 dia?	1971 May 28.5	51.77	88.81	6597	197	240	0.003	62
D	Fragments	1971-43D,E											
D	Cosmos 421	1971-44A	1971 May 19.43 172.75 days 1971 Nov 8.18	Ellipsoid 400?	1.8 long 1.2 dia	1971 May 19.8 1971 Aug 16.5	70.96 70.96	91.99 91.23	6749 6713	273 259	469 410	0.014 0.011	75 -
D	Cosmos 421 rocket	1971-44B	1971 May 19.43 96.33 days 1971 Aug 23.76	Cylinder 1500?	8 long 1.65 dia	1971 May 19.7	70.98	91.85	6743	274	455	0.013	73

* Cosmos 419 was probably an attempted Mars probe.

**1971-43C ejected from 1971-43A about 1971 May 28.4

† Manoeuvrable

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Mars 2 launcher rocket	1971-45B	1971 May 19.68 2 days 1971 May 21	Cylinder 4000?	12 long? 4 dia	1971 May 20.7	51.52	87.52	6533	137	172	0.003	24
D	Mars 2 launcher	1971-45C	1971 May 19.68 2 days 1971 May 21	-	-	1971 May 20.7	51.52	87.53	6533	137	173	0.003	24
	Cosmos 422	1971-46A	1971 May 22.03 1200 years	Cylinder + boom? 700?	1.4 long 2.0 dia	1971 May 23.6	74.03	105.10	7377	988	1010	0.001	242
	Cosmos 422 rocket	1971-46B	1971 May 22.03 600 years	Cylinder 2200?	7.4 long 2.4 dia	1971 May 22.4	74.03	104.99	7372	983	1004	0.001	210
D	Cosmos 423	1971-47A	1971 May 27.50 183.16 days 1971 Nov 26.66	Ellipsoid 400?	1.8 long 1.2 dia	1971 May 28.8 1971 Aug 31.7	71.03 71.03	92.15 91.34	6758 6718	272 257	487 423	0.016 0.012	74 -
D	Cosmos 423 rocket	1971-47B	1971 May 27.50 93.96 days 1971 Aug 29.46	Cylinder 1500?	8 long 1.65 dia	1971 May 28.8	71.03	91.91	6746	274	461	0.014	72
D R	Cosmos 424	1971-48A	1971 May 28.44 12.71 days 1971 Jun 10.15	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1971 May 30.6 1971 Jun 1.6	65.40 65.41	89.36 89.40	6621 6623	204 177	282 313	0.006 0.010	65 59
D	Cosmos 424 rocket	1971-48B	1971 May 28.44 6.15 days 1971 Jun 3.59	Cylinder 2500?	7.5 long 2.6 dia	1971 May 30.3	65.40	89.15	6611	196	270	0.006	46

1971-48 continued on page 262

Space vehicle: Mars 2, 1971-45A

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 424 engine*	1971-48C	1971 May 28.44 18 days 1971 Jun 15	Cone 600? full	1.5 long? 2 dia?	1971 Jun 9.6	65.41	89.15	6611	175	291	0.009	59
D	Fragments	1971-48D,E											
D	Mars 3 launcher rocket	1971-49B	1971 May 28.64 3 days 1971 May 31	Cylinder 4000?	12 long? 4 dia	1971 May 29.9	51.57	88.21	6567	139	239	0.008	100
D	Mars 3 launcher	1971-49C	1971 May 28.64 3 days 1971 May 31	-	-	1971 May 29.9	51.57	88.17	6565	140	234	0.007	66
D	Fragment	1971-49D											
	Cosmos 425	1971-50A	1971 May 29.16 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1971 Jun 6.9	74.03	95.24	6908	506	553	0.003	316
	Cosmos 425 rocket	1971-50B	1971 May 29.16 10 years	Cylinder 2200?	7.4 long 2.4 dia	1971 Jun 6.9	74.04	95.20	6906	499	556	0.004	310
D	Fragments	1971-50C-F											
	Cosmos 426	1971-52A	1971 Jun 4.76 35 years	Octagonal ellipsoid? 400?	1.8 long? 1.5 dia?	1971 Jun 6.6	74.03	109.29	7571	389	1997	0.106	132
	Cosmos 426 rocket	1971-52B	1971 Jun 4.76 30 years	Cylinder 2200?	7.4 long 2.4 dia	1971 Jun 6.3	74.03	109.17	7565	389	1985	0.106	132
D	Fragments	1971-52C-F											

*1971-48C ejected from 1971-48A about 1971 Jun 9.5.

Space Vehicles: Mars 3, 1971-49A
Mariner 9, 1971-51A; and Centaur rocket, 1971-51B

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Soyuz 11*	1971-53A	1971 Jun 6.21	Sphere-cylinder +	7.5 long	1971 Jun 6.4	51.57	88.41	6577	189	209	0.002	285
3M			23.76 days	2 wings	2.2 dia	1971 Jun 6.6	51.60	88.30	6571	177	209	0.002	291
R			1971 Jun 29.97	6790?		1971 Jun 9.9	51.56	89.66	6638	256	264	0.001	74
D	Soyuz 11 rocket	1971-53B	1971 Jun 6.21	Cylinder	7.5 long	1971 Jun 6.5	51.63	88.31	6572	176	211	0.003	286
			1.64 days	2500?	2.6 dia								
			1971 Jun 7.85										
	SESP-1† [Thor Burner 2]	1971-54A	1971 Jun 8.59	Sphere-cone?	3.0 long?	1971 Jun 9.0	90.22	95.95	6941	545	581	0.003	210
			10 years	260?	1.31 dia?								
D	Cosmos 427	1971-55A	1971 Jun 11.42	Sphere-cylinder	6.5 long?	1971 Jun 12.3	72.84	89.70	6637	204	314	0.008	58
R			11.8 days	6300?	2.4 dia	1971 Jun 22.9	72.85	89.48	6626	177	319	0.011	46
			1971 Jun 23.2										
D	Cosmos 427 rocket	1971-55B	1971 Jun 11.42	Cylinder	7.5 long	1971 Jun 11.5	72.80	89.66	6635	205	309	0.008	59
			8.88 days	2500?	2.6 dia								
			1971 Jun 20.30										
D	Cosmos 427 engine**	1971-55E	1971 Jun 11.42	Cone	1.5 long?	1971 Jun 23.6	72.85	89.36	6620	176	308	0.010	47
			17 days	600? full	2 dia?								
			1971 Jun 28										
D	Fragments	1971-55C, D											
D	[Titan 3D]	1971-56A	1971 Jun 15.78	Cylinder	15 long	1971 Jun 16.1	96.41	89.38	6620	184	300	0.009	170
			52 days	13300? full	3.0 dia	1971 Jul 3.2	96.39	89.31	6617	183	294	0.008	166
			1971 Aug 6										
D	Titan 3D rocket	1971-56B	1971 Jun 15.78	Cylinder	6 long	1971 Jun 17.4	96.39	88.93	6599	179	262	0.006	170
			4.65 days	1900	3.0 dia								
			1971 Jun 20.43										

*Soyuz 11 docked with Salyut 1 from 1971 Jun 7.32 to Jun 29.77. Crew died from depressurisation after jettisoning orbital module Jun 29.95.

**1971-55E ejected from 1971-55A on 1971 Jun 23.

† Space Experiments Support Program.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 428	1971-57A	1971 Jun 24.34 11.93 days 1971 Jul 6.27	Sphere-cylinder 5900?	**5.9 long 2.4 dia**	1971 Jun 25.0	51.76	89.07	6610	206	257	0.004	39
D	Cosmos 428 rocket	1971-57B	1971 Jun 24.34 4.33 days 1971 Jun 28.67	Cylinder 2500?	7.5 long 2.6 dia	1971 Jun 25.7	51.74	88.79	6596	194	241	0.004	21
D	Cosmic Ray Package B*	1971-57G	1971 Jun 24.34 19 days 1971 Jul 13	**Ellipsoid 200?**	**0.9 long 1.9 dia**	1971 Jul 5.9	51.76	88.82	6597	199	239	0.003	80
D	Fragments	1971-57C-F											
	Explorer 44 (SR 10)**	1971-58A	1971 Jul 8.96 8 years	12-sided cylinder + 4 vanes 118	0.58 long 0.76 dia	1971 Jul 9.1	51.06	95.23	6911	433	632	0.014	278
D	Explorer 44 rocket	1971-58B	1971 Jul 8.96 **1665 days 1976 Jan 28**	Cylinder 24	1.50 long 0.46 dia	1971 Jul 11.1 1972 Sep 16.0	51.06 51.06	95.23 94.48	6911 6875	435 418	630 575	0.014 0.011	284 -
D	Fragments	1971-58C, D											
	Meteor 9	1971-59A	1971 Jul 16.07 60 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1971 Jul 16.2	81.19	97.29	7006	614	642	0.002	329
	Meteor 9 rocket	1971-59B	1971 Jul 16.07 60 years	Cylinder 1440	3.8 long 2.6 dia	1971 Jul 20.3	81.21	97.53	7017	559	719	0.011	174
D	Fragment	1971-59C											

*1971-57G ejected from 1971-57A on 1971 Jul 5.

** Solar Radiation.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	[Thorad Agena D]	1971-60A	1971 Jul 16.45 2603 days 1978 Aug 31	Cylinder 2000?	8 long? 1.5 dia	1971 Jul 18.9 1973 Nov 1.0	75.00 74.99	94.59 94.00	6876 6848	488 462	508 477	0.001 0.001	243 -
D R	Cosmos 429	1971-61A	1971 Jul 20.42 12.9 days 1971 Aug 2.3	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1971 Jul 22.6 1971 Jul 24.2	51.76 51.76	88.98 88.81	6605 6597	202 179	252 258	0.004 0.006	34 66
D	Cosmos 429 rocket	1971-61B	1971 Jul 20.42 2.94 days 1971 Jul 23.36	Cylinder 2500?	7.5 long 2.6 dia	1971 Jul 21.2	51.76	88.76	6594	185	247	0.005	19
D	Cosmos 429 engine*	1971-61E	1971 Jul 20.42 15 days 1971 Aug 4	Cone 600? full	1.5 long? 2 dia?	1971 Aug 3.2	51.81	89.89	6651	185	360	0.013	37
D	Fragments	1971-61C,D											
D R	Cosmos 430	1971-62A	1971 Jul 23.46 12.7 days 1971 Aug 5.2	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1971 Jul 24.4 1971 Jul 26.5	65.41 65.40	89.54 89.05	6630 6606	199 188	305 267	0.008 0.006	50 76
D	Cosmos 430 rocket	1971-62B	1971 Jul 23.46 5.70 days 1971 Jul 29.16	Cylinder 2500?	7.5 long 2.6 dia	1971 Jul 24.8	65.41	89.17	6612	193	274	0.006	29
D	Cosmos 430 engine**	1971-62F	1971 Jul 23.46 16.74 days 1971 Aug 9.20	Cone 600? full	1.5 long? 2 dia?	1971 Aug 5.3	65.41	88.68	6587	181	237	0.004	66
D	Fragments	1971-62C-E,G											

* 1971-61E ejected from 1971-61A about 1971 Aug 1.

** 1971-62F ejected from 1971-62A about 1971 Aug 4.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Apollo 15**	1971-63A	1971 Jul 26.57	Cone-cylinder	11.15 long	1971 Jul 26.6	32.56	87.77	6549	169	173	0.0003	-*
3M			12.30 days	3.91 dia		1971 Jul 26.8	33.2	26320	292520	200	572080	0.977	30*
R			1971 Aug 7.87	30340 initially				In selenocentric orbit 1971 Jul 29.84 to Aug 4.89					
D	Saturn IVB [Saturn 510]	1971-63B	1971 Jul 26.57	Cylinder	18.7 long	1971 Jul 26.6	32.56	87.77	6549	169	173	0.0003	-*
			3.30 days	13990	6.6 dia	1971 Jul 26.8	33.2	26320	292520	200	572080	0.977	30*
			1971 Jul 29.87					Crashed on Moon 1971 Jul 29.87					
D	LEM 10 descent stage	1971-63E	1971 Jul 26.57	Octagon + 4 legs	1.57 high	1971 Jul 26.8	33.2	26320	292520	200	572080	0.977	30*
			4.36 days	11404 full?	3.13 wide			Entered selenocentric orbit 1971 Jul 29.84					
			1971 Jul 30.93	2803 empty				Landed on Moon 1971 Jul 30.93					
D	LEM 10† ascent stage	1971-63C	1971 Jul 26.57	Box + tanks	2.52 high	1971 Jul 26.8	33.2	26320	292520	200	572080	0.977	30*
			7.56 days	5030 full?	3.76 wide			On Moon's surface 1971 Jul 30.93 to Aug 2.72					
			1971 Aug 3.13	2127 empty	3.13 deep			Finally crashed on Moon 1971 Aug 3.13					
D	Molniya 1T	1971-64A	1971 Jul 28.15	Windmill + 6 vanes	3.4 long	1971 Aug 1.6	65.37	704.99	26239	468	39254	0.739	285
			2183 days	1000?	1.6 dia	1971 Sep 1.0	65.43	717.75	26556	478	39877	0.742	-
			1977 Jul 19										
D	Molniya 1T launcher	1971-64B	1971 Jul 28.15	Irregular	-	1971 Jul 28.6	65.42	91.29	6716	217	459	0.018	63
			32.20 days										
			1971 Aug 29.35										
D	Molniya 1T launcher rocket	1971-64C	1971 Jul 28.15	Cylinder	7.5 long	1971 Jul 30.0	65.40	91.28	6716	202	473	0.020	63
			26.96 days	2500?	2.6 dia								
			1971 Aug 24.11										
D	Molniya 1T rocket	1971-64D	1971 Jul 28.15	Cylinder	2.0 long	1971 Aug 1.6	65.37	700.62	26131	442	39064	0.739	285
			2209 days	440	2.0 dia								
			1977 Aug 14										
D	Fragments	1971-64E,F											

** Apollo attached to LEM separated from Saturn IVB on Jul 26.74.

*Approximate orbits.

† LEM with two crew members separated from Apollo on Jul 30.74
Ascent stage relaunched from Moon Aug 2.72; briefly docked with Apollo Aug 2.80. **(Apollo 15 subsatellite, 1971-63D, in selenocentric orbit)**

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 431	1971-65A	1971 Jul 30.36 11.91 days 1971 Aug 11.27	Sphere-cylinder 5700?	5.0 long 2.4 dia	1971 Jul 31.5	51.77	88.95	6604	194	257	0.005	21
D	Cosmos 431 rocket	1971-65B	1971 Jul 30.36 5.06 days 1971 Aug 4.42	Cylinder 2500?	7.5 long 2.6 dia	1971 Jul 31.3	51.78	88.84	6598	202	237	0.003	0
D	Fragment	1971-65C											
D R	Cosmos 432 †	1971-66A	1971 Aug 5.42 12.91 days 1971 Aug 18.33	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1971 Aug 6.7	51.74	88.97	6605	194	259	0.005	73
D	Cosmos 432 rocket	1971-66B	1971 Aug 5.42 3.91 days 1971 Aug 9.33	Cylinder 2500?	7.5 long 2.6 dia	1971 Aug 5.7	51.77	88.88	6600	191	253	0.005	15
D	Cosmos 432 engine*	1971-66D	1971 Aug 5.42 16 days 1971 Aug 21	Cone 600? full	1.5 long? 2 dia ?	1971 Aug 18.4	51.74	88.62	6587	187	231	0.003	-
D	Fragments	1971-66C,E											
D	OV1-20	1971-67A	1971 Aug 7.00 22.00 days 1971 Aug 29.00	Cylinder 70?	2.05 long? 0.72 dia?	1971 Aug 7.0	92.00	106.16	7423	133	1957	0.123	173
	OV1-21 rocket	1971-67B	1971 Aug 7.00 80 years	Cone-cylinder 70?	2.05 long 0.72 dia	1971 Aug 9.5	87.64	102.01	7231	792	914	0.008	216
D	Cannonball 2	1971-67C	1971 Aug 7.00 177.72 days 1972 Jan 31.72	Sphere 364	0.66 dia	1971 Aug 7.4	92.01	106.29	7430	133	1970	0.124	172
D	Musketball	1971-67D	1971 Aug 7.00 43.60 days 1971 Sep 19.60	Sphere 61	0.30 dia	1971 Aug 7.2	87.61	94.87	6889	137	884	0.054	167

*1971-66D ejected from 1971-66A about 1971 Aug 17.

† Manoeuvrable

1971-67 launch continued on page 268.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Rigid Sphere 2 (LCS 4) *	1971-67E	1971 Aug 7.00 75 years	Sphere (magnesium) 37	1.12 dia	1971 Aug 9.2	87.62	102.03	7232	795	913	0.008	219
D	Balloon (Mylar)	1971-67F	1971 Aug 7.00 309 days 1972 Jun 11	Inflated sphere 0.8	2.13 dia	1971 Aug 8.3 1972 Apr 10.6	87.61 87.62	101.86 98.77	7224 7082	777 684	914 724	0.009 0.003	214 119
	Grid sphere 2	1971-67G	1971 Aug 7.00 10 years	Spherical skeleton 4.0	2.13 dia	1971 Aug 8.7	87.64	101.93	7227	783	915	0.009	216
	Grid sphere 1	1971-67H	1971 Aug 7.00 15 years	Spherical skeleton 6.2	2.13 dia	1971 Sep 1.0	87.63	101.92	7227	777	920	0.009	-
	Apogee rocket	1971-67K	1971 Aug 7.00 75 years	Cone + nozzle 30?	1.1 long 1.2 dia	1971 Sep 1.0	87.63	102.05	7233	792	918	0.009	-
	Rigid Sphere 1	1971-67P	1971 Aug 7.00 20 years	Sphere (aluminium) 1.6	0.61 dia	1971 Sep 1.0	87.63	101.98	7230	786	917	0.009	-
	Fragments	1971-67J,L-N											
D R?	Cosmos 433	1971-68A	1971 Aug 8.99 0.06 days 1971 Aug 9.05	Cylinder	2 long? 1 dia?	1971 Aug 9.0	49.41	88.54	6584	112	299	0.014	-
D	Cosmos 433 launch platform	1971-68B	1971 Aug 8.99 1.79 days 1971 Aug 10.78	Irregular	-	1971 Aug 9.2	49.41	88.55	6584	112	300	0.014	169
D	Cosmos 433 rocket	1971-68C	1971 Aug 8.99 1.04 days 1971 Aug 10.03	Cylinder 1500?	8 long? 2.5 dia?	1971 Aug 9.8	49.50	87.58	6536	142	174	0.003	113

* Lincoln Calibration Satellite

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 434	1971-69A	1971 Aug 12.23 9 years	-	-	1971 Aug 12.9 1971 Aug 16.4	51.60	88.98	6606	188	267	0.006	85
							Orbit similar to 1971-69 D						
						1971 Aug 27.3	51.60	228.24	12373	186	11804	0.469	93
D	Cosmos 434 rocket	1971-69B	1971 Aug 12.23 6 days 1971 Aug 18	Cylinder 2500?	7.5 long 2.6 dia	1971 Aug 12.9	51.59	88.98	6606	194	261	0.005	86
D	Cosmos 434 platform	1971-69D	1971 Aug 12.23 77 days 1971 Oct 28	-	-	1971 Aug 17.5	51.60	99.90	7137	189	1328	0.080	92
D	Fragment	1971-69C											
D	[Titan 3B Agena D]	1971-70A	1971 Aug 12.59 22 days 1971 Sep 3	Cylinder 3000?	8 long? 1.5 dia	1971 Aug 13.2 1971 Aug 30.2	111.00 110.96	90.13 89.98	6659 6651	137 136	424 410	0.022 0.021	134 128
D	Fragment	1971-70B											
	Eole 1*	1971-71A	1971 Aug 16.78 80 years	Cone-octagon 84	0.58 long 0.71 dia	1971 Aug 28.1	50.16	100.62	7169	677	904	0.016	353
	Eole 1 rocket	1971-71B	1971 Aug 16.78 60 years	Cylinder 24	1.50 long 0.46 dia	1971 Aug 18.3	50.18	100.55	7166	667	908	0.017	322
	Fragments	1971-71C,D											
D	Cosmos 435	1971-72A	1971 Aug 27.46 153.60 days 1972 Jan 28.06	Ellipsoid 400?	1.8 long 1.2 dia	1971 Aug 28.0 1971 Nov 16.0	70.96 70.96	92.09 91.28	6755 6715	271 257	482 417	0.016 0.012	79 -
D	Cosmos 435 rocket	1971-72B	1971 Aug 27.46 84.67 days 1971 Nov 20.13	Cylinder 1500?	8 long 1.65 dia	1971 Aug 28.0	70.98	91.96	6748	272	468	0.015	80

*French Cooperative Applications Satellite 1, launched by NASA. To study southern-hemisphere winds: 'Eole' is god of the winds.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Luna 18 launcher rocket	1971-73D	1971 Sep 2.57 4.56 days 1971 Sep 7.13	Cylinder 4000?	12 long? 4 dia	1971 Sep 3.7	51.56	88.64	6588	193	227	0.003	334
D	Luna 18 launcher	1971-73C	1971 Sep 2.57 4.64 days 1971 Sep 7.21	-	-	1971 Sep 3.5	51.57	88.72	6592	186	242	0.004	327
D	Fragment	1971-73E											
	Cosmos 436	1971-74A	1971 Sep 7.06 10 years	Cylinder + paddles? 900?	2 long ? 1 dia?	1971 Sep 19.9	74.04	95.18	6905	509	545	0.003	309
	Cosmos 436 rocket	1971-74B	1971 Sep 7.06 10 years	Cylinder 2200?	7.4 long 2.4 dia	1971 Sep 19.8	74.04	95.03	6898	502	537	0.002	329
D	Fragments*	1971-74C-Q											
	Cosmos 437	1971-75A	1971 Sep 10.15 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1971 Sep 10.4	74.05	95.31	6911	519	548	0.002	345
	Cosmos 437 rocket	1971-75B	1971 Sep 10.15 10 years	Cylinder 2200?	7.4 long 2.4 dia	1971 Sep 10.3	74.05	95.18	6905	508	545	0.003	170
D	Fragment	1971-75C											
D	[Thorad Agena D]	1971-76A	1971 Sep 10.90 25.02 days 1971 Oct 5.92	Cylinder 2000?	8 long? 1.5 dia	1971 Sep 11.6	74.95	88.48	6578	156	244	0.007	156
D	Capsule	1971-76B	1971 Sep 10.90 1607 days 1976 Feb 3	Octagon? 60?	0.3 long? 0.9 dia?	1971 Sep 11.5 1972 Nov 16.0	75.07 75.07	96.40 93.94	6877 6845	492 456	507 477	0.001 0.002	236 -
D	Fragment	1971-76C											

Space Vehicle: Luna 18, 1971-73A; and fragment, 1971-73B.

*Fragments designated 1971-74H to Q probably belong to the 1971-75, -103, and -114 launches.

AD-A067 931 ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH (ENGLAND) F/G 22/3
REVISED TABLE OF EARTH SATELLITES. VOLUME 2. 1969 TO 1973.(U)
JAN 79 J A PILKINGTON, D G KING-HELE
UNCLASSIFIED RAE-TR-79001 DRIC-BR-66975 NL

2 OF 2
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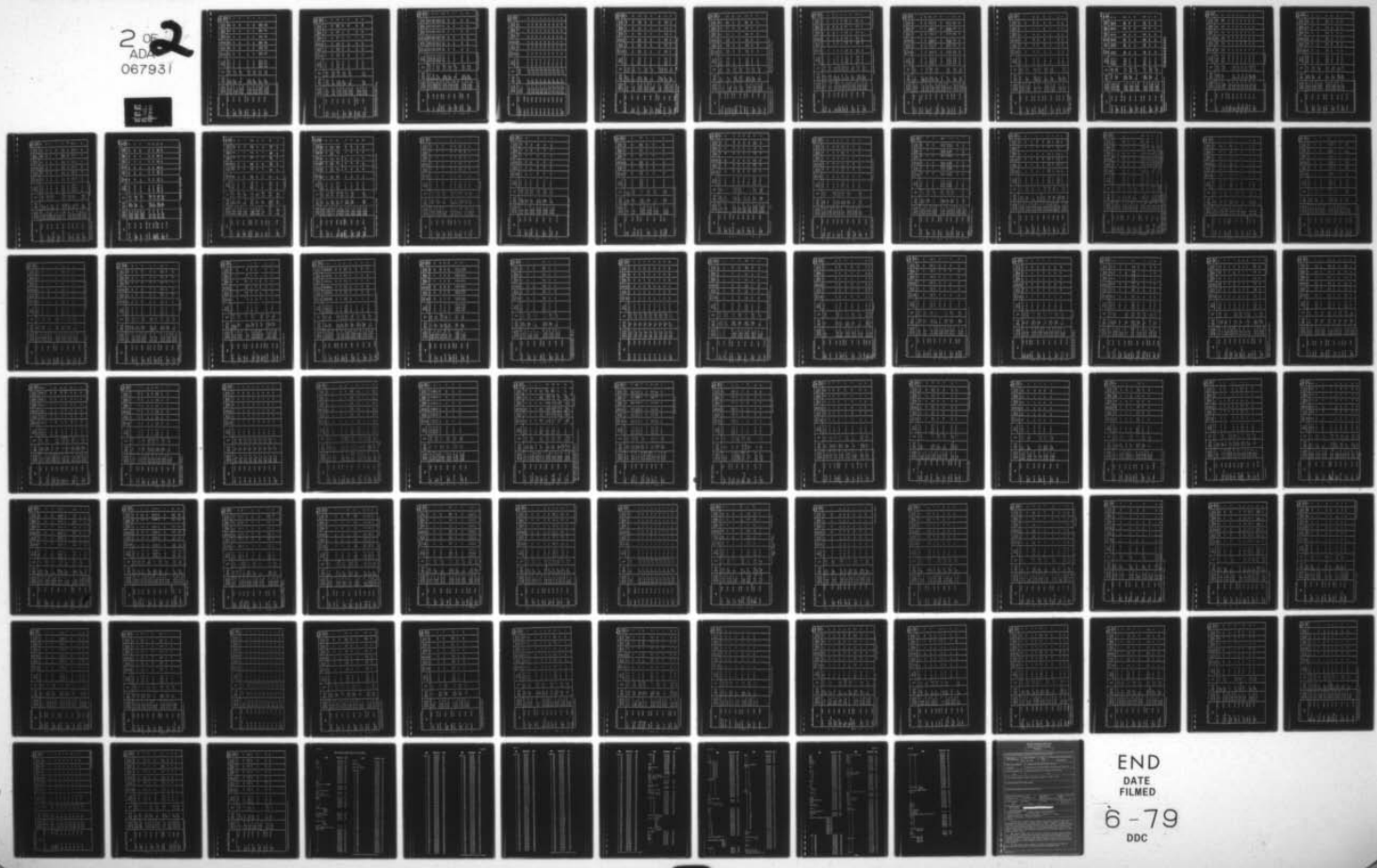

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	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 438	1971-77A	1971 Sep 14.54	Sphere-cylinder	6.5 long?	1971 Sep 15.2	65.40	89.54	6630	208	296	0.007	72
R			12.72 days	6300?	2.4 dia	1971 Sep 21.7	65.40	89.44	6625	175	319	0.011	62
			1971 Sep 27.26										
D	Cosmos 438 rocket	1971-77B	1971 Sep 14.54	Cylinder	7.5 long	1971 Sep 15.5	65.39	89.34	6620	196	288	0.007	63
			8 days	2500?	2.6 dia								
			1971 Sep 22										
D	Cosmos 438 engine*	1971-77F	1971 Sep 14.54	Cone	1.5 long?	1971 Sep 27.7	65.40	88.80	6593	170	260	0.007	62
			15.55 days	600? full	2 dia?								
			1971 Sep 30.09										
D	Fragments	1971-77C-E											
D	Cosmos 439	1971-78A	1971 Sep 21.50	Sphere-cylinder	5.0 long	1971 Sep 23.4	65.41	89.41	6624	207	284	0.006	89
R			10.74 days	5700?	2.4 dia								
			1971 Oct 2.24										
D	Cosmos 439 rocket	1971-78B	1971 Sep 21.50	Cylinder	7.5 long	1971 Sep 22.4	65.41	89.28	6617	203	275	0.005	77
			6.46 days	2500?	2.6 dia								
			1971 Sep 27.96										
D	Cosmos 440	1971-79A	1971 Sep 24.44	Ellipsoid	1.8 long	1971 Sep 30.9	71.00	95.21	6907	272	785	0.037	71
			401.18 days	400?	1.2 dia	1972 Feb 1.0	70.99	94.38	6866	267	709	0.032	-
			1972 Oct 29.62			1972 Jun 16.0	70.99	92.66	6783	254	555	0.022	-
D	Cosmos 440 rocket	1971-79B	1971 Sep 24.44	Cylinder	8 long	1971 Sep 28.5	71.00	95.19	6906	270	785	0.037	74
			229.38 days	1500?	1.65 dia	1972 Jan 1.0	71.00	93.98	6847	265	672	0.030	-
			1972 May 10.82										

*1971-77F ejected from 1971-77A about 1971 Sep 27.2.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Shinsei [Mu 4S]	1971-80A	1971 Sep 28.17 5000 years	26-faced polyhedron 65	0.75 long 0.71 dia	1971 Oct 1.1	32.06	112.92	7745	869	1865	0.064	136
	Shinsei rocket	1971-80B	1971 Sep 28.17 4000 years	Sphere-cone 90?	1.86 long 0.79 dia	1971 Sep 30.9	32.05	111.75	7689	867	1755	0.058	137
D	Cosmos 441	1971-81A	1971 Sep 28.32 11.91 days 1971 Oct 10.23	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1971 Sep 28.8 1971 Oct 1.7	65.02 65.04	89.21 89.00	6614 6604	204 173	268 278	0.005 0.008	33 57
R													
D	Cosmos 441 rocket	1971-81B	1971 Sep 28.32 5.09 days 1971 Oct 3.41	Cylinder 2500?	7.5 long 2.6 dia	1971 Sep 28.7	65.03	89.02	6605	206	247	0.003	35
D	Cosmos 441 engine*	1971-81E	1971 Sep 28.32 15.25 days 1971 Oct 13.57	Cone 600? full	1.5 long? 2 dia?	1971 Oct 11.6	65.04	88.66	6587	174	244	0.005	53
D	Fragments	1971-81C,D,F,G											
D	Luna 19 launcher	1971-82B	1971 Sep 28.42 3.45 days 1971 Oct 1.87	-	-	1971 Sep 28.5	51.58	88.76	6594	172	260	0.007	348
D	Luna 19 launcher rocket	1971-82D	1971 Sep 28.42 3.39 days 1971 Oct 1.81	Cylinder 4000?	12 long? 4 dia	1971 Sep 29.1	51.59	88.44	6578	198	202	0.0003	357

*1971-81E ejected from 1971-81A about 1971 Oct 10.
Space Vehicle: Luna 19, 1971-82A; and fragment, 1971-82C.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	OSO 7	1971-83A	1971 Sep 29.41 1013.90 days 1974 Jul 9.31	Nonagonal box + vane 635	1.71 long? 1.42 dia?	1971 Oct 2.9 1972 Jun 1.0 1973 May 16.5	33.13 33.13 33.13	93.40 92.84 91.86	6825 6798 6749	323 315 298	571 525 443	0.018 0.015 0.011	91 - -
D	TTS 3 †	1971-83B	1971 Sep 29.41 2547 days 1978 Sep 19	Octahedron 20	0.30 side	1971 Oct 3.2 1973 May 1.0	33.09 33.09	94.17 93.58	6863 6834	398 385	572 527	0.013 0.010	85 -
D	OSO 7 second stage	1971-83C	1971 Sep 29.41 847.61 days	Cylinder 350?	4.9 long 1.43 dia	1971 Oct 1.1 1972 Jul 1.0	33.08 33.08	93.88 93.17	6849 6814	371 358	570 514	0.015 0.011	70 -
D	Fragment	1971-83D	1974 Jan 24.02			1973 Apr 16.0	33.08	92.13	6762	333	435	0.007	-
D R	Cosmos 442	1971-84A	1971 Sep 29.48 12.75 days 1971 Oct 12.23	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1971 Oct 2.9 1971 Oct 6.3	72.86 72.81	89.47 89.62	6626 6634	182 179	313 333	0.010 0.012	58 56
D	Cosmos 442 rocket	1971-84B	1971 Sep 29.48 6.51 days 1971 Oct 5.99	Cylinder 2500?	7.5 long 2.6 dia	1971 Oct 2.8	72.85	89.01	6603	195	254	0.004	74
D	Cosmos 442 engine*	1971-84D	1971 Sep 29.48 18.38 days 1971 Oct 17.86	Cone 600? full	1.5 long? 2 dia?	1971 Oct 12.2	72.85	89.37	6621	177	309	0.010	41
D	Fragments	1971-84C,E											
D R	Cosmos 443	1971-85A	1971 Oct 7.52 11.67 days 1971 Oct 19.19	Sphere-cylinder 5900?	5.9 long 2.4 dia	1971 Oct 8.9	65.40	89.55	6631	204	301	0.007	61
D	Cosmos 443 rocket	1971-85B	1971 Oct 7.52 6.47 days 1971 Oct 13.99	Cylinder 2500?	7.5 long 2.6 dia	1971 Oct 8.4	65.39	89.42	6624	199	293	0.007	52

*1971-84D ejected from 1971-84A about 1971 Oct 12.

† Test and Training Satellite.

1971-85 continued on page 274

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Excess Radiation Package B*	1971-85F	1971 Oct 7.52 23 days 1971 Oct 30	Ellipsoid 200?	0.9 long 1.9 dia	1971 Oct 26.2	65.40	88.61	6584	186	225	0.003	-
D	Fragments	1971-85C-E											
	Cosmos 444	1971-86A	1971 Oct 13.57 6000 years	Spheroid 40?	1.0 long? 0.8 dia?	1971 Oct 13.9	74.03	114.16	7795	1324	1509	0.012	108
	Cosmos 445	1971-86B	1971 Oct 13.57 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1971 Oct 19.9	74.03	114.53	7811	1353	1513	0.010	104
	Cosmos 446	1971-86C	1971 Oct 13.57 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1971 Oct 15.0	74.03	114.88	7827	1384	1513	0.008	117
	Cosmos 447	1971-86D	1971 Oct 13.57 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1971 Oct 16.9	74.03	115.21	7843	1414	1515	0.006	122
	Cosmos 448	1971-86E	1971 Oct 13.57 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1971 Oct 14.0	74.03	115.58	7860	1441	1522	0.005	130
	Cosmos 449	1971-86F	1971 Oct 13.57 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1971 Oct 16.2	74.04	116.33	7892	1484	1544	0.004	194
	Cosmos 450	1971-86G	1971 Oct 13.57 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1971 Oct 14.8	74.03	115.94	7876	1465	1530	0.004	168
	Cosmos 451	1971-86H	1971 Oct 13.57 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1971 Oct 21.2	74.03	116.73	7911	1492	1574	0.005	212
	Cosmos 444 rocket	1971-86J	1971 Oct 13.57 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1971 Oct 14.8	74.03	117.43	7943	1501	1628	0.008	247

*1971-85F ejected from 1971-85A about 1971 Oct 19

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi-major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	[Thor Burner 2]†	1971-87A	1971 Oct 14.40 80 years	12-faced frustum 195	1.64 long 1.31 to 1.10 dia	1971 Oct 14.9	98.96	101.68	7215	796	877	0.006	231
	Burner 2 rocket	1971-87B	1971 Oct 14.40 60 years	Sphere-cone 66	1.32 long 0.94 dia	1971 Oct 14.4	98.94	101.78	7220	796	888	0.006	230
D	Cosmos 452	1971-88A	1971 Oct 14.38 12.83 days 1971 Oct 27.21	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1971 Oct 15.4 1971 Oct 19.5	64.97 64.98	89.07 89.41	6607 6624	198 176	260 316	0.005 0.011	17 50
D	Cosmos 452 rocket	1971-88B	1971 Oct 14.38 4.48 days 1971 Oct 18.86	Cylinder 2500?	7.5 long 2.6 dia	1971 Oct 15.8	64.98	88.70	6589	189	233	0.003	359
D	Cosmos 452 engine*	1971-88E	1971 Oct 14.38 16 days 1971 Oct 30	Cone 600? full	1.5 long? 2 dia?	1971 Oct 28.1	64.97	90.07	6657	196	362	0.012	18
D	Fragments	1971-88C,D,F											
	ASTEX** [Thorad Agena D]	1971-89A	1971 Oct 17.57 200 years	Cylinder + 2 wings 1500?	9.6 long? 1.5 dia 9.8 span	1971 Oct 27.0	92.72	100.65	7166	773	803	0.002	348
D	Cosmos 453	1971-90A	1971 Oct 19.53 151.55 days 1972 Mar 19.08	Ellipsoid 400?	1.8 long 1.2 dia	1971 Oct 26.2 1972 Jan 1.0	71.00 71.00	92.19 91.47	6760 6725	271 259	493 434	0.016 0.013	67 -
D	Cosmos 453 rocket	1971-90B	1971 Oct 19.53 73.61 days 1972 Jan 1.14	Cylinder 1500?	8 long 1.65 dia	1971 Oct 24.9	71.00	92.08	6754	270	482	0.016	73
D	Fragment	1971-90C											

* 1971-88E ejected from 1971-88A on 1971 Oct 26.

**USAF Advanced Space Technology Experiments.

† DMSP: USAF Defense Meteorological Satellite Program

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	ITOS B*	1971-91A	1971 Oct 21.48	Cylinder	4.9 long	1971 Oct 23.9	102.62	102.53	7255	279	1474	0.082	149
	second stage		274 days	350?	1.43 dia	1972 Mar 16.5	102.59	99.63	7117	292	1186	0.063	-
			1972 Jul 21										
3d	Fragments	1971-91B-E											
D	[Titan 3B	1971-92A	1971 Oct 23.72	Cylinder	8 long ?	1971 Oct 24.3	110.94	90.02	6653	134	416	0.021	135
	Agena D]		25 days	3000?	1.5 dia	1971 Oct 31.4	110.96	89.95	6650	133	410	0.021	133
			1971 Nov 17										
D	Fragment	1971-92B											
T	Prospero**	1971-93A	1971 Oct 28.17	26-faced	0.70 long	1971 Nov 1.0	82.06	106.53	7443	547	1582	0.069	329
	[Black Arrow]		150 years	polyhedron	1.12 dia								
				66									
	Waxwing rocket	1971-93B	1971 Oct 28.17	Cylinder +	1.36 long	1971 Oct 30.5	82.05	106.62	7447	546	1593	0.070	333
			100 years	nozzle 47	0.71 dia								
	Fragment***	1971-93C											
D	Cosmos 454	1971-94A	1971 Nov 2.60	Sphere-	6.5 long?	1971 Nov 2.9	65.42	89.14	6611	203	262	0.004	53
R			13.7 days	cylinder	2.4 dia	1971 Nov 4.9	65.45	90.03	6655	203	350	0.011	44
			1971 Nov 16.3	6300?									
D	Cosmos 454	1971-94B	1971 Nov 2.60	Cylinder	7.5 long	1971 Nov 2.9	65.44	89.05	6606	199	257	0.004	39
	rocket		4.12 days	2500?	2.6 dia								
			1971 Nov 6.72										
D	Cosmos 454	1971-94D	1971 Nov 2.60	Cone	1.5 long?	1971 Nov 16.1	65.45	89.88	6647	202	336	0.010	35
	engine†		22.45 days	600? full	2 dia?								
			1971 Nov 25.05										
D	Fragments	1971-94C,E,F											

*The satellite ITOS B failed to achieve orbit

†1971-94D ejected from 94A on 1971 Nov 14.

**UK technological satellite, known as X3 before launch.

***This object is probably an aerial about 1 m long.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	DSCS 1† [Titan 3C]	1971-95A	1971 Nov 3.13 > million years	Cylinder + 2 dishes 522	1.83 long 2.74 dia	1971 Nov 25.9	2.70	1435.2	42148	35065	36475	0.017	201
	DSCS 2	1971-95B	1971 Nov 3.13 > million years	Cylinder + 2 dishes 522	1.83 long 2.74 dia	1971 Nov 27.9	2.28	1438.0	42202	35349	36299	0.011	227
	DSCS 1 rocket	1971-95C	1971 Nov 3.13 > million years	Cylinder 1500?	6 long? 3.0 dia	1971 Nov 3.4	2.63	1481.3	43043	36089	37240	0.013	199
	Explorer 45 (SSS-1)*	1971-96A	1971 Nov 15.24 25 years?	Octagon 52	0.76 long 0.68 dia	1971 Nov 18.0	3.58	466.85	19942	233	26895	0.669	261
	Explorer 45 rocket	1971-96B	1971 Nov 15.24 20 years?	Cylinder 24	1.50 long 0.46 dia	1972 Apr 15.1	3.27	457.7	19677	275	26323	0.662	81
D	Cosmos 455	1971-97A	1971 Nov 17.47 143.55 days 1972 Apr 9.02	Ellipsoid 400?	1.8 long 1.2 dia	1971 Nov 19.9 1972 Feb 1.0	71.00 71.00	92.19 91.46	6760 6724	272 259	491 433	0.016 0.013	73 -
D	Cosmos 455 rocket	1971-97B	1971 Nov 17.47 82.60 days 1972 Feb 8.07	Cylinder 1500?	8 long 1.65 dia	1971 Nov 18.0	70.98	92.03	6752	274	473	0.015	77
D R	Cosmos 456	1971-98A	1971 Nov 19.50 12.8 days 1971 Dec 2.3	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1971 Nov 20.9 1971 Nov 26.4	72.86 72.87	89.34 89.98	6619 6651	178 186	304 360	0.010 0.013	55 64
D	Cosmos 456 rocket	1971-98B	1971 Nov 19.50 6.25 days 1971 Nov 25.75	Cylinder 2500?	7.5 long 2.6 dia	1971 Nov 19.8	72.87	89.50	6627	201	297	0.007	57

*Small scientific satellite

†Defence Satellite Communication System

1971-98 continued on page 278

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 456 engine*	1971-98E	1971 Nov 19.50 21.27 days 1971 Dec 10.77	Cone 600? full	1.5 long? 2 dia?	1971 Dec 2.4	72.84	89.75	6640	187	336	0.011	52
D	Fragments	1971-98C,D,F-H											
	Cosmos 457	1971-99A	1971 Nov 20.75 3000 years	Spheroid + paddles? 650?	1.6 dia?	1971 Nov 23.5	74.04	109.50	7581	1185	1221	0.002	224
	Cosmos 457 rocket	1971-99B	1971 Nov 20.75 2000 years	Cylinder 2200?	7.4 long 2.4 dia	1971 Nov 27.6	74.03	109.37	7575	1182	1212	0.002	200
D	Molniya 2A	1971-100A	1971 Nov 24.40 28 months? 1974 Mar?	Windmill + 6 vanes? 1250?	4.2 long? 1.6 dia?	1971 Nov 24.4 1972 Feb 1.0 1972 Aug.1.0	65.47 65.47 65.47	712.03 717.71 717.73	26414 26555 26555	517 466 567	39554 39887 39787	0.739 0.742 0.739	285 - -
D	Molniya 2A launcher rocket	1971-100B	1971 Nov 24.40 25.13 days 1971 Dec 19.53	Cylinder 2500?	7.5 long 2.6 dia	1971 Nov 24.7	65.42	91.06	6705	218	436	0.016	60
D	Molniya 2A launcher	1971-100C	1971 Nov 24.40 36.33 days 1971 Dec 30.73	Irregular	-	1971 Nov 24.7	65.43	91.42	6723	225	465	0.018	68
D	Molniya 2A rocket	1971-100E	1971 Nov 24.40 773 days 1974 Jan 5	Cylinder 440	2.0 long 2.0 dia	1972 Jan 1.0 1972 Aug 1.0 1973 Jun 1.0	65.47 65.47 65.47	703.63 703.53 703.41	26206 26203 26200	450 551 348	39205 39099 39296	0.739 0.736 0.743	- - -
D	Fragment	1971-100D											
D	Cosmos 458	1971-101A	1971 Nov 29.43 142.90 days 1972 Apr 20.33	Ellipsoid 400?	1.8 long 1.2 dia	1971 Nov 29.7 1972 Feb 15.5	70.96 70.96	92.25 91.52	6763 6727	272 258	497 440	0.017 0.014	80 -
D	Cosmos 458 rocket	1971-101B	1971 Nov 29.43 77.49 days 1972 Feb 14.92	Cylinder 1500?	8 long 1.65 dia	1971 Nov 30.1	70.96	92.07	6754	270	481	0.016	84

*1971-98E ejected from 1971-98A on 1971 Dec 1.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 459	1971-102A	1971 Nov 29.73 27.92 days 1971 Dec 27.65	Cylinder?	4 long? 2 dia?	1971 Dec 3.2	65.81	89.34	6620	224	260	0.003	3
D	Cosmos 459 rocket	1971-102B	1971 Nov 29.73 11.29 days 1971 Dec 11.02	Cylinder 2200?	7.4 long 2.4 dia	1971 Nov 30.2	65.87	89.34	6621	223	262	0.003	4
D	Fragment	1971-102C											
	Cosmos 460	1971-103A	1971 Nov 30.70 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1971 Nov 30.9	74.01	95.25	6908	528	532	0.0003	328
	Cosmos 460 rocket	1971-103B	1971 Nov 30.70 10 years	Cylinder 2200?	7.4 long 2.4 dia	1971 Dec 1.9	74.04	95.14	6903	508	541	0.002	349
D	Fragment	1971-103C											
D	Intercosmos 5	1971-104A	1971 Dec 2.35 126.84 days 1972 Apr 7.19	Ellipsoid 400?	1.8 long 1.2 dia	1971 Dec 4.0	48.42	98.49	7068	198	1181	0.070	110
D	Intercosmos 5 rocket	1971-104B	1971 Dec 2.35 90.67 days 1972 Mar 2.02	Cylinder 1500?	8 long 1.65 dia	1971 Dec 5.4	48.43	98.21	7054	199	1152	0.068	116
D	Fragment	1971-104C											
	Cosmos 461*	1971-105A	1971 Dec 2.73 7¼ years	Cylinder? 950?	-	1971 Dec 5.5	69.23	94.61	6878	488	511	0.002	352
	Cosmos 461 rocket	1971-105B	1971 Dec 2.73 7¼ years	Cylinder 2200?	7.4 long 2.4 dia	1971 Dec 6.6	69.23	94.45	6870	476	507	0.002	11
D	Fragments	1971-105C,D											

* Gamma radiation studies

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 462*	1971-106A	1971 Dec 3.55 1218.35 days 1975 Apr 4.90	Cylinder?	4 long? 2 dia?	1971 Dec 5.9 1972 Aug 1.0 1973 Oct 1.0	65.75 65.75 65.75	105.43 103.06 98.80	7393 7282 7081	230 212 220	1800 1595 1185	0.106 0.095 0.068	53 - -
D	Cosmos 462 rocket	1971-106C	1971 Dec 3.55 33.23 days 1972 Jan 5.78	Cylinder 1500?	8 long? 2.5 dia?	1971 Dec 5.0	62.31	101.96	7230	143	1561	0.098	57
D	Fragments	1971-106B, D-AE											
D R	Cosmos 463	1971-107A	1971 Dec 6.41 4.96 days 1971 Dec 11.37	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1971 Dec 6.6 1971 Dec 9.6	64.97 64.97	89.24 89.27	6616 6617	202 182	273 296	0.005 0.009	37 45
D	Cosmos 463 rocket	1971-107B	1971 Dec 6.41 5.39 days 1971 Dec 11.80	Cylinder 2500?	7.5 long 2.6 dia	1971 Dec 6.8	64.99	89.18	6613	202	267	0.005	38
D	Cosmos 463 engine**	1971-107D	1971 Dec 6.41 9.57 days 1971 Dec 15.98	Cone 600? full	1.5 long? 2 dia?	1971 Dec 10.3	64.97	89.17	6612	180	288	0.008	48
D	Fragment	1971-107C											
D R	Cosmos 464	1971-108A	1971 Dec 10.46 5.8 days 1971 Dec 16.3	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1971 Dec 11.0 1971 Dec 14.9	72.84 72.86	90.34 89.23	6669 6614	206 178	375 293	0.013 0.009	72 30
D	Cosmos 464 rocket	1971-108B	1971 Dec 10.46 14.25 days 1971 Dec 24.71	Cylinder 2500?	7.5 long 2.6 dia	1971 Dec 11.0	72.85	90.26	6665	205	369	0.012	69
D	Cosmos 464 engine †	1971-108E	1971 Dec 10.46 9.23 days 1971 Dec 19.69	Cone 600? full	1.5 long? 2 dia?	1971 Dec 15.4	72.86	89.09	6607	166	291	0.009	23
D	Fragments	1971-108C, D											

*Cosmos 462 passed close to Cosmos 459 on 1971 Dec 3.70, then exploded.

**1971-107D ejected from 1971-107A on 1971 Dec 10.

† 1971-108E ejected from 1971-108A on 1971 Dec 15.

Year of launch 1971, continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Ariel 4*	1971-109A	1971 Dec 11.86 2557.8 days 1978 Dec 12.7	Cylinder + 4 paddles 99.5	0.91 long 0.76 dia	1971 Dec 12.6 1973 Nov 1.0	82.99 82.99	95.35 94.74	6913 6883	477 457	593 552	0.008 0.007	242 -
D	Ariel 4 rocket	1971-109B	1971 Dec 11.86 2433 days 1978 Aug 9	Cylinder 24	1.5 long 0.46 dia	1971 Dec 12.6 1973 Aug 1.0	83.00 82.99	95.33 94.72	6912 6882	477 457	591 550	0.008 0.007	244 -
D	Fragments	1971-109C,D											
T	[Thorad Agena D]	1971-110A	1971 Dec 14.51 700 years	-	-	1971 Dec 26.5	70.00	104.93	7369	983	999	0.001	235
	Agena D rocket	1971-110B	1971 Dec 14.51 600 years	Cylinder 700?	6 long? 1.5 dia	1971 Dec 29.2	70.02	104.17	7333	943	967	0.002	297
T?	[Thorad Agena D] **	1971-110C	1971 Dec 14.51 700 years	Box + aerials?	0.3 x 0.9 x 2.4?	1971 Dec 26.4	70.01	104.93	7369	983	999	0.001	242
T?	[Thorad Agena D] **	1971-110D	1971 Dec 14.51 700 years	Box + aerials?	0.3 x 0.9 x 2.4?	1972 Jan 1.5	70.01	104.90	7368	982	997	0.001	221
T?	[Thorad Agena D] **	1971-110E	1971 Dec 14.51 700 years	Box + aerials?	0.3 x 0.9 x 2.4?	1972 Jan 1.0	70.01	104.89	7367	981	997	0.001	-
	Cosmos 465	1971-111A	1971 Dec 15.19 1200 years	Cylinder + boom? 700?	1.4 long 2.0 dia	1971 Dec 29.2	74.03	104.94	7369	970	1012	0.003	260
	Cosmos 465 rocket	1971-111B	1971 Dec 15.19 600 years	Cylinder 2200?	7.4 long 2.4 dia	1971 Dec 26.9	74.03	104.83	7364	970	1002	0.002	263

*British satellite, known as UK4 before launch.

** SSU precursors

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 466	1971-112A	1971 Dec 16.41	Sphere-cylinder	6.5 long?	1971 Dec 16.8	65.01	89.39	6623	209	280	0.005	43
R			10.9 days	2.4 dia		1971 Dec 23.6	64.99	89.94	6650	179	365	0.014	51
			1971 Dec 27.3	6300?									
D	Cosmos 466 rocket	1971-112B	1971 Dec 16.41	Cylinder	7.5 long	1971 Dec 17.3	65.01	89.20	6614	193	278	0.006	25
			4.63 days	2500?	2.6 dia								
			1971 Dec 21.04										
D	Cosmos 466 engine*	1971-112C	1971 Dec 16.41	Cone	1.5 long?	1971 Dec 27.7	65.01	89.78	6642	173	355	0.014	48
			17.66 days	600? full	2 dia?								
			1972 Jan 3.07										
D	Fragment	1971-112D											
D	Cosmos 467	1971-113A	1971 Dec 17.45	Ellipsoid	1.8 long	1971 Dec 23.6	71.00	91.95	6748	267	472	0.015	78
			122.80 days	400?	1.2 dia	1972 Feb 15.5	71.00	91.44	6723	260	430	0.013	-
			1972 Apr 18.25										
D	Cosmos 467 rocket	1971-113B	1971 Dec 17.45	Cylinder	8 long	1971 Dec 20.4	71.01	91.80	6740	270	454	0.014	80
			62.38 days	1500?	1.65 dia								
			1972 Feb 17.83										
	Cosmos 468	1971-114A	1971 Dec 17.54	Cylinder + paddles?	2 long?	1971 Dec 27.2	74.03	100.83	7176	786	809	0.002	22
			120 years	750?	1 dia?								
	Cosmos 468 rocket	1971-114B	1971 Dec 17.54	Cylinder	7.4 long	1971 Dec 26.1	74.03	100.76	7172	775	813	0.003	16
			100 years	2200?	2.4 dia								
	Fragments	1971-114C-E											

* 1971-112C ejected from 1971-112A about 1971 Dec 26.

Year of launch 1971, continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi-major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Molniya 1U	1971-115A	1971 Dec 19.96 1942 days 1977 Apr 13	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1971 Dec 29.3 1972 Feb 1.0	65.42 65.42	703.28 717.79	26197 26557	499 417	39139 39940	0.738 0.744	285 -
D	Molniya 1U rocket	1971-115B	1971 Dec 19.96 2104 days 1977 Sep 22	Cylinder 440	2.0 long 2.0 dia	1971 Dec 31.2	65.45	699.22	26097	451	38986	0.738	285
D	Molniya 1U launcher rocket	1971-115C	1971 Dec 19.96 38 days 1972 Jan 26	Cylinder 2500?	7.5 long 2.6 dia	1971 Dec 21.7	65.41	91.56	6730	222	481	0.019	72
D	Molniya 1U launcher	1971-115D	1971 Dec 19.96 39 days 1972 Jan 27	Irregular	-	1971 Dec 21.7	65.37	91.64	6734	222	489	0.020	71
	Intelsat 4B (F-3)	1971-116A	1971 Dec 20.05 >million years	Cylinder 1410 full 707 empty	2.82 long 2.39 dia	1971 Dec 20.1 1972 Jan 1.0	28.23 0.4	640.3 1436.2	24616 42167	550 35749	35926 35828	0.719 0.001	179 -
	Intelsat 4B rocket	1971-116B	1971 Dec 20.05 6000 years	Cylinder 1815	8.6 long 3.0 dia	1971 Dec 20.1	28.23	640.3	24616	550	35926	0.719	179**
	Cosmos 469	1971-117A	1971 Dec 25.48 600 years	Cone-cylinder	6 long? 2 dia?	1971 Dec 26.0 1972 Jan 15.6	64.94 64.50	89.60 104.74	6634 7360	249 941	262 1023	0.001 0.006	286 346
D	Cosmos 469* platform	1971-117B	1971 Dec 25.48 45.60 days 1972 Feb 9.08	Irregular	-	1972 Jan 4.4	64.96	89.57	6632	247	261	0.001	301
D	Cosmos 469* rocket	1971-117C	1971 Dec 25.48 13.16 days 1972 Jan 7.64	Cylinder 1500?	8 long? 2.5 dia?	1972 Jan 4.1	64.96	89.48	6628	244	255	0.001	305

*1971-117C, and probably 1971-117B, attached to 1971-117A until orbit change on 1972 Jan 4.29.

**Approximate orbit.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 470	1971-118A	1971 Dec 27.59 9.76 days 1972 Jan 6.35	Sphere-cylinder 5900?	5.9 long 2.4 dia	1971 Dec 28.6	65.42	89.03	6605	194	260	0.005	18
D	Cosmos 470 rocket	1971-118B	1971 Dec 27.59 2.95 days 1971 Dec 30.54	Cylinder 2500?	7.5 long 2.6 dia	1971 Dec 28.6	65.43	88.75	6591	177	249	0.005	17
D	Capsule*	1971-118C	1971 Dec 27.59 10.02 days 1972 Jan 6.61	Ellipsoid 200?	0.9 long 1.9 dia	1972 Jan 6.3	65.43	88.43	6575	183	211	0.002	5
D	Fragments	1971-118D, E											
	Aureole 1**	1971-119A	1971 Dec 27.79 70 years	Octagonal ellipsoid 400?	1.8 long? 1.5 dia?	1972 Jan 1.9	73.98	114.65	7817	400	2477	0.133	98
	Aureole 1 rocket	1971-119B	1971 Dec 27.79 50 years	Cylinder 2200?	7.4 long 2.4 dia	1972 Jan 3.0	74.00	114.51	7810	394	2469	0.133	96
D	Fragments	1971-119C-E											
	Meteor 10	1971-120A	1971 Dec 29.45 500 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1972 Jan 2.2 1972 Feb 17.5	81.25 81.25	102.66 102.32	7262 7245	878 859	889 874	0.001 0.001	221 - †
	Meteor 10 rocket	1971-120B	1971 Dec 29.45 500 years	Cylinder 1440	3.8 long 2.6 dia	1972 Jan 2.6	81.26	102.72	7264	845	927	0.006	168
	Fragments	1971-120C-E											

*1971-118C ejected from 1971-118A about 1972 Jan 6.

**French satellite, launched by USSR.

† Meteor 10 carried orbital adjustment motor.

Year of launch 1972

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 471	1972-01A	1972 Jan 12.42	Sphere-cylinder	6.5 long?	1972 Jan 12.8	6..99	89.66	6637	201	316	0.009	57
R			12.9 days	2.4 dia		1972 Jan 23.2	64.99	88.96	6602	178	270	0.007	49
			1972 Jan 25.3	6300?									
D	Cosmos 471 rocket	1972-01B	1972 Jan 12.42	Cylinder	7.5 long	1972 Jan 12.8	65.01	89.58	6633	198	311	0.008	54
			7.84 days	2500?	2.6 dia								
			1972 Jan 20.26										
D	Cosmos 471 engine*	1972-01G	1972 Jan 12.42	Cone	1.5 long?	1972 Jan 26.2	64.98	88.50	6579	181	220	0.003	15
			14 days	600? full	2 dia?								
			1972 Jan 26										
D	Fragments	1972-01C-F											
D	[Titan 3D]	1972-02A	1972 Jan 20.77	Cylinder	15 long	1972 Jan 21.3	97.00	89.41	6622	157	331	0.013	140
			40 days	13300? full	3.0 dia	1972 Jan 31.8	97.00	89.47	6625	149	344	0.015	126
			1972 Feb 29										
D	Titan 3D rocket	1972-02B	1972 Jan 20.77	Cylinder	6 long	1972 Jan 20.9	96.99	89.23	6613	163	306	0.011	139
			2.70 days	1900	3.0 dia								
			1972 Jan 23.47										
T	Capsule	1972-02D	1972 Jan 20.77	Octagon	0.3 long?	1972 Jan 31.4	96.59	94.86	6889	472	549	0.006	129
			7½ years	60?	0.9 dia?								
D	Fragment	1972-02C											
	Intelsat 4C(F-4)	1972-03A	1972 Jan 23.01	Cylinder +	2.82 long	1972 Jan 25.9	28.22	654.5	24967	562	36615	0.722	181**
			> million years	2 aerials	2.39 dia	1972 Apr 16.0	0.4	1436.1	42166	35781	35794	0.0002	-
				1410 full									
	Intelsat 4C rocket	1972-03B	1972 Jan 23.01	Cylinder	8.6 long	1972 Jan 26.9	28.22	654.5	24967	562	36615	0.722	181
			6000 years	1815	3.0 dia								

* 1972-01G ejected from 1972-01A about 1972 Jan 23

** Approximate orbit

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 472	1972-04A	1972 Jan 25.47 206.48 days 1972 Aug 18.95	Ellipsoid 400?	1.8 long 1.2 dia	1972 Jan 28.2 1972 May 1.0	82.01 81.99	102.26 98.37	7243 7058	194 186	1536 1173	0.093 0.070	67 -
D	Cosmos 472 rocket	1972-04B	1972 Jan 25.47 101.58 days 1972 May 6.05	Cylinder 1500?	8 long 1.65 dia	1972 Jan 27.9	82.00	102.15	7238	193	1526	0.092	69
D	Heos 2*	1972-05A	1972 Jan 31.72 913.73 days 1974 Aug 2.45	16-faced cylinder 117	0.75 long 1.33 dia	1972 Feb 3.5 1973 Jul 1.0	89.91 88.0	7477.1 7496.9	126663 126894	405 5442	240164 235589	0.946 0.907	310 -
D	Heos 2 second stage	1972-05B	1972 Jan 31.72 2431 days 1978 Sep 27	Cylinder 350?	4.9 long 1.43 dia	1972 Jan 31.8 1973 May 16.5	89.81 89.79	99.25 97.91	7100 7036	320 310	1123 1005	0.057 0.049	279 -
D	Heos 2 rocket	1972-05C	1972 Jan 31.72 31 months? 1974 Aug?	Cylinder 24	1.50 long 0.46 dia	Orbit similar to 1972-05A							
D	Fragments	1972-05D,E											
D R	Cosmos 473	1972-06A	1972 Feb 3.36 11.90 days 1972 Feb 15.26	Sphere-cylinder 5700?	5.0 long 2.4 dia	1972 Feb 4.0	65.01	89.68	6638	205	314	0.008	51
D	Cosmos 473 rocket	1972-06B	1972 Feb 3.36 8.24 days 1972 Feb 11.60	Cylinder 2500?	7.5 long 2.6 dia	1972 Feb 3.7	65.04	89.59	6633	203	307	0.008	46
D	Luna 20 launcher	1972-07C	1972 Feb 14.14 3.57 days 1972 Feb 17.71	-	-	1972 Feb 14.5	51.51	88.73	6593	191	238	0.004	317
D	Luna 20 launcher rocket	1972-07D	1972 Feb 14.14 3.78 days 1972 Feb 17.92	Cylinder 4000?	12 long? 4 dia	1972 Feb 15.0	51.48	88.64	6588	188	232	0.003	322

Space Vehicle: Luna 20, 1972-07A; Luna 20 rocket, 1972-07B

* Highly eccentric orbit satellite, launched for ESRO by NASA

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 474†	1972-08A	1972 Feb 16.40 12.9 days 1972 Feb 29.3	Sphere-cylinder 6300?	6.5 long 2.4 dia	1972 Feb 17.4	64.97	89.79	6643	213	317	0.008	72
D	Cosmos 474 rocket	1972-08B	1972 Feb 16.40 7.50 days 1972 Feb 23.90	Cylinder 2500?	7.5 long 2.6 dia	1972 Feb 17.9	64.98	89.63	6635	202	312	0.008	48
D	Cosmos 474 engine*	1972-08E	1972 Feb 16.40 14 days 1972 Mar 1	Cone 600? full	1.5 long? 2 dia?	1972 Feb 29.3	64.95	90.45	6676	195	401	0.015	9
D	Fragments	1972-08C, D											
	Cosmos 475	1972-09A	1972 Feb 25.40 1200 years	Cylinder + boom? 700?	1.4 long 2.0 dia	1972 Feb 25.8	74.08	104.81	7363	970	1000	0.002	287
	Cosmos 475 rocket	1972-09B	1972 Feb 25.40 600 years	Cylinder 2200?	7.4 long 2.4 dia	1972 Feb 25.5	74.09	104.69	7357	964	994	0.002	291
T	IMEWS 3 [Titan 3C]	1972-10A	1972 Mar 1.40 >million years	Cylinder + 4 panels 820?	6 long? 2.5 dia?	1972 Mar 1.5 1972 Apr 1.0	28.58 0.2	89.47 1429.9	6633 42067	153 35416	357 35962	0.015 0.006	114 -
	Transtage	1972-10B	1972 Mar 1.40 >million years	Cylinder 1500?	6 long? 3 dia	1972 Apr 1.0	0.2	1429.9	42067	35416	35962	0.006	-
D	Titan 3C second stage	1972-10C	1972 Mar 1.40 2.00 days 1972 Mar 3.40	Cylinder 1900	6 long 3.0 dia	1972 Mar 2.4	28.63	88.88	6604	151	300	0.011	123

* 1972-08E ejected from 1972-08A about 1972 Feb 28.

† Manoeuvrable

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 476	1972-11A	1972 Mar 1.47 60 years	Cylinder + 2 vanes? 2500?	5 long? 1.5 dia?	1972 Mar 5.9	81.23	97.24	7003	617	633	0.001	180
	Cosmos 476 rocket	1972-11B	1972 Mar 1.47 60 years	Cylinder 1440	3.8 long 2.6 dia	1972 Mar 5.9	81.23	97.35	7009	569	692	0.009	160
D	Pioneer 10 second stage	1972-12C	1972 Mar 3.08 168 days 1972 Aug 18	Cylinder 1815	8.6 long 3.0 dia	1972 Apr 1.0	31.6	1523.2	43852	158	74789	0.851	-
D R	Cosmos 477	1972-13A	1972 Mar 4.42 11.8 days 1972 Mar 16.2	Sphere-cylinder 5900?	5.9 long 2.4 dia	1972 Mar 5.0	72.85	89.60	6632	202	306	0.008	65
D	Cosmos 477 rocket	1972-13B	1972 Mar 4.42 5.99 days 1972 Mar 10.41	Cylinder 2500?	7.5 long 2.6 dia	1972 Mar 4.8	72.84	89.48	6626	202	294	0.007	62
D	Excess Radiation Package C	1972-13E	1972 Mar 4.42 19.07 days 1972 Mar 23.49	Ellipsoid 200?	0.9 long 1.9 dia	1972 Mar 14.7	72.85	89.43	6624	199	292	0.007	49
D	Fragments	1972-13C,D,F											

Space vehicle: Pioneer 10, 1972-12A; Burner 2 rocket, 1972-12B

Year of launch 1972 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	TD 1A * (ESRO)	1972-14A	1972 Mar 12.08 10 years	Box + paddles 472	2.12 x 0.99 x 0.89	1972 Mar 12.9	97.55	95.41	6916	524	551	0.002	323
	TD 1A second stage	1972-14B	1972 Mar 12.08 10 years	Cylinder 350?	4.9 long 1.43 dia	1972 Mar 12.9	97.54	95.34	6912	525	543	0.001	323
D	Fragments	1972-14C-E											
D	Cosmos 478	1972-15A	1972 Mar 15.54 12.68 days 1972 Mar 28.22	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1972 Mar 16.2 1972 Mar 23.8	65.39 65.40	89.48 89.65	6628 6636	204 177	295 339	0.007 0.012	75 58
R													
D	Cosmos 478 rocket	1972-15B	1972 Mar 15.54 6.33 days 1972 Mar 21.87	Cylinder 2500?	7.5 long 2.6 dia	1972 Mar 15.8	65.41	89.46	6627	177	320	0.011	54
D	Cosmos 478 engine**	1972-15F	1972 Mar 15.54 15 days 1972 Mar 30	Cone 600? full	1.5 long? 2 dia?	1972 Mar 29.7	65.42	89.83	6645	189	345	0.012	19
D	Fragments	1972-15C-E											
D	[Titan 3B Agena D]	1972-16A	1972 Mar 17.71 25 days 1972 Apr 11	Cylinder 3000?	8 long? 1.5 dia	1972 Mar 18.2	110.98	89.91	6648	131	409	0.021	149

* Thor Delta

** 1972-15F ejected from 1972-15A about 1972 Mar 25

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 479	1972-17A	1972 Mar 22.86 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1972 Apr 2.5	74.06	95.20	6906	514	542	0.002	306
	Cosmos 479 rocket	1972-17B	1972 Mar 22.86 10 years	Cylinder 2200?	7.4 long 2.4 dia	1972 Apr 1.5	74.07	95.10	6901	506	540	0.003	324
D	Fragments	1972-17C-E											
T	[Thor Burner 2]†	1972-18A	1972 Mar 24.37 100 years	12-sided frustum 195	1.64 long 1.31 to 1.10 dia	1972 Mar 28.1	98.80	101.83	7222	803	885	0.006	217
	Burner 2 rocket	1972-18B	1972 Mar 24.37 80 years	Sphere-cone 66	1.32 long 0.94 dia	1972 Mar 27.5	98.80	101.72	7217	801	876	0.005	221
	Cosmos 480	1972-19A	1972 Mar 25.10 3000 years	Spheroid + paddles? 650?	1.6 dia?	1972 Mar 26.3	82.97	109.21	7567	1175	1203	0.002	229
	Cosmos 480 rocket	1972-19B	1972 Mar 25.10 2000 years	Cylinder 2200?	7.4 long 2.4 dia	1972 Mar 27.7	82.97	109.07	7561	1171	1194	0.001	207
D	Cosmos 481 *	1972-20A	1972 Mar 25.45 161.39 days 1972 Sep 2.84	Ellipsoid 400?	1.8 long 1.2 dia	1972 Mar 26.2 1972 Jun 1.0	71.03 71.03	92.40 91.52	6770 6727	269 255	514 443	0.018 0.014	82 -
D	Cosmos 481 rocket	1972-20B	1972 Mar 25.45 77.70 days 1972 Jun 11.15	Cylinder 1500?	8 long 1.65 dia	1972 Mar 26.3	71.03	92.26	6763	270	499	0.017	83

* Geomagnetic studies

† DMSP

Year of launch 1972 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi-major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Venus 8 launcher rocket	1972-21B	1972 Mar 27.18 2.26 days 1972 Mar 29.44	Cylinder 2500?	7.5 long 2.6 dia	1972 Mar 27.9	51.78	88.57	6585	191	222	0.002	84
D	Venus 8 launcher	1972-21C	1972 Mar 27.18 2.73 days 1972 Mar 29.91	Irregular	-	1972 Mar 28.0	51.77	88.79	6596	194	241	0.004	110
	Meteor 11	1972-22A	1972 Mar 30.59 500 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1972 Apr 1.6	81.23	102.59	7258	868	891	0.002	257
	Meteor 11 rocket	1972-22B	1972 Mar 30.59 400 years	Cylinder 1440	3.8 long 2.6 dia	1972 Apr 2.5	81.24	102.72	7264	840	932	0.006	172
	Cosmos 482*	1972-23A	1972 Mar 31.17 8 years	Sphere-cylinder 1180	3.5 long 1.2 dia	1972 Mar 31.8 1973 Dec 16.5	52.22 52.19	201.44 185.50	11383 10777	205 209	9805 8589	0.422 0.389	42 -
D	Cosmos 482 launcher rocket	1972-23B	1972 Mar 31.17 1.74 days 1972 Apr 1.91	Cylinder 2500?	7.5 long 2.6 dia	1972 Mar 31.5	51.78	88.54	6584	196	215	0.001	116
D p	Cosmos 482 launcher	1972-23C	1972 Mar 31.17 2.38 days 1972 Apr 2.55	Irregular	-	1972 Mar 31.9	51.74	88.59	6586	179	237	0.004	125
	Cosmos 482 rocket	1972-23D	1972 Mar 31.17 9 years	Cylinder 5410? full	2.0 long 2.0 dia	1972 Apr 3.2	52.16	200.93	11365	207	9767	0.421	44
	Fragment	1972-23E											

Space vehicle: Venus 8, 1972-21A

*Probably an attempted Venus probe.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 483 *	1972-24A	1972 Apr 3.43 11.82 days 1972 Apr 15.25	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1972 Apr 3.8	72.81	89.74	6639	209	313	0.008	73
D	Cosmos 483 rocket	1972-24B	1972 Apr 3.43 8.47 days 1972 Apr 11.90	Cylinder 2500?	7.5 long 2.6 dia	1972 Apr 4.2	72.80	89.64	6634	202	310	0.008	63
D	Cosmos 483 engine**	1972-24D	1972 Apr 3.43 15.95 days 1972 Apr 19.38	Cone 600? full	1.5 long? 2 dia?	1972 Apr 13.9	72.82	89.47	6626	180	315	0.010	33
D	Fragments	1972-24C,E											
D	Molniya 1v	1972-25A	1972 Apr 4.86 666 days 1974 Jan 30	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1972 Apr 5.0 1972 May 1.0 1973 Mar 16.5	65.6 65.53 65.7	705.35 717.69 717.65	26248 26554 26553	480 442 360	39260 39910 39990	0.739 0.743 0.746	285 285 -
D	Molniya 1v rocket	1972-25G	1972 Apr 4.86 703 days 1974 Mar 8	Cylinder 440	2.0 long 2.0 dia	1972 May 1.0 1972 Nov 1.0 1973 Mar 16.5	65.5 65.6 65.7	700.02 700.00 698.5	26116 26116 26078	454 338 214	39022 39137 39186	0.738 0.743 0.747	- - -
D	Molniya 1v launcher rocket	1972-25C	1972 Apr 4.86 23.70 days 1972 Apr 28.56	Cylinder 2500?	7.5 long 2.6 dia	1972 Apr 6.1	65.54	91.28	6716	222	454	0.017	66
D	Molniya 1v launcher	1972-25D	1972 Apr 4.86 33.29 days 1972 May 8.15	Irregular	-	1972 Apr 6.2	65.52	91.57	6730	231	473	0.018	70
D	SRET 1†	1972-25B	1972 Apr 4.86 693 days? 1974 Feb 26?	Octahedron 15.4	0.56 dia	1972 May 1.0	65.6	704.70	26232	458	39250	0.739	-
D	Fragments	1972-25E,F											

* Manoeuvrable.

** 1972-24D ejected from 1972-24A on 1972 Apr 13.

† French "Satellite for Research on Environment and Technology".

Year of launch 1972 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi-major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 484	1972-26A	1972 Apr 6.34 11.87 days 1972 Apr 18.21	Sphere-cylinder 5900?	5.9 long 2.4 dia	1972 Apr 7.3	81.30	88.73	6588	196	224	0.002	302
D	Cosmos 484 rocket	1972-26B	1972 Apr 6.34 2.08 days 1972 Apr 8.42	Cylinder 2500?	7.5 long 2.6 dia	1972 Apr 6.9	81.31	88.58	6581	184	221	0.003	333
D	Solar Radiation Package A	1972-26C	1972 Apr 6.34 12.52 days 1972 Apr 18.86	Ellipsoid 200?	0.9 long 1.9 dia	1972 Apr 18.6	81.30	88.01	6553	170	179	0.001	-
D R	Intercosmos 6	1972-27A	1972 Apr 7.42 4.0 days 1972 Apr 11.4	Cylinder? 5700? (payload 1070)	5.0 long 2.4 dia	1972 Apr 7.7	51.78	88.94	6604	203	248	0.003	24
D	Intercosmos 6 rocket	1972-27B	1972 Apr 7.42 2.85 days 1972 Apr 10.27	Cylinder 2500?	7.5 long 2.6 dia	1972 Apr 7.8	51.73	88.79	6596	192	244	0.004	4
D	Cosmos 485	1972-28A	1972 Apr 11.46 140.77 days 1972 Aug 30.23	Ellipsoid 400?	1.8 long 1.2 dia	1972 Apr 11.6 1972 Jun 16.0	70.99 70.99	92.05 91.14	6753 6709	271 254	479 408	0.015 0.012	87 -
D	Cosmos 485 rocket	1972-28B	1972 Apr 11.46 65.90 days 1972 Jun 16.36	Cylinder 1500?	8 long 1.65 dia	1972 Apr 11.5	70.98	91.85	6743	276	453	0.013	87
	Prognoz 1	1972-29A	1972 Apr 14.04 10 years?	Spheroid + 4 vanes 845	1.8 dia	1972 Apr 14.1 1972 May 1.0	64.92 65.0	91.22 5782.1	6713 106714	224 1005	446 199 667	0.016 0.931	60 -
D	Prognoz 1 launcher rocket	1972-29B	1972 Apr 14.04 27.56 days 1972 May 11.60	Cylinder 2500?	7.5 long 2.6 dia	1972 Apr 14.8	64.97	91.20	6712	227	440	0.016	61

1972-29 continued on page 294

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Prognoz 1 launcher	1972-29C	1972 Apr 14.04 33.29 days 1972 May 17.33	Irregular	-	1972 Apr 15.9	64.96	91.40	6 722	228	459	0.017	65
	Prognoz 1 rocket	1972-29F	1972 Apr 14.04 10 years?	Cylinder 440	2.0 long 2.0 dia	Orbit similar to 1972-29A							
D	Fragments	1972-29D,E											
D	Cosmos 486	1972-30A	1972 Apr 14.34	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1972 Apr 15.9	81.33	88.64	6 584	178	234	0.004	67
R			12.9 days 1972 Apr 27.2			1972 Apr 20.3	81.33	89.09	6 606	186	270	0.006	65
D	Cosmos 486 rocket	1972-30B	1972 Apr 14.34 3.59 days 1972 Apr 17.93	Cylinder 2500?	7.5 long 2.6 dia	1972 Apr 14.4	81.32	89.04	6 604	209	243	0.003	21
D	Cosmos 486 engine	1972-30F	1972 Apr 14.34 14 days 1972 Apr 28	Cone 600? full	1.5 long? 2 dia?	1972 Apr 28.0	81.25	88.83	6 594	188	243	0.004	1
D	Fragments	1972-30C-E											
D	Apollo 16**	1972-31A	1972 Apr 16.75	Cone-cylinder 30358 full	11.15 long 3.91 dia	1972 Apr 16.8	32.56	87.82	6 552	169	178	0.0007	-*
R			11.07 days			1972 Apr 17.0	33.2	26320	292 520	200	572 080	0.977	30*
3M			1972 Apr 27.82			In selenocentric orbit 1972 Apr 19.85 to Apr 25.09							
D	Saturn IVB [Saturn 511]	1972-31B	1972 Apr 16.75 3.13 days 1972 Apr 19.88	Cylinder 13970	18.7 long 6.6 dia	1972 Apr 16.8	32.56	87.82	6 552	169	178	0.0007	-*
						1972 Apr 17.0	33.2	26320	292 520	200	572 080	0.977	30*
						Crashed on Moon 1972 Apr 19.88							
D	LEM 11 descent stage	1972-31E	1972 Apr 16.75 4.35 days 1972 Apr 21.10	Octagon + legs. 11398 2759 empty	1.57 high 3.13 wide	1972 Apr 17.0	33.2	26320	292 520	200	572 080	0.977	30*
						Entered selenocentric orbit 1972 Apr 19.85							
						Landed on Moon 1972 Apr 21.10							
	LEM 11*** ascent stage	1972-31C	1972 Apr 16.75 Indefinite	Box + tanks 5040 full 2134 empty	2.52 high 3.76 wide 3.13 deep	1972 Apr 17.0	33.2	26320	292 520	200	572 080	0.977	30*
						On Moon's surface 1972 Apr 21.10 to Apr 24.06 Now in selenocentric orbit.							

** Apollo attached to LEM, separated from Saturn IVB on Apr 16.93.

*** LEM with two crew members separated from Apollo on Apr 20.76.
Ascent stage relaunched from Moon Apr 24.06; briefly docked with Apollo Apr 24.14

* Approximate orbits.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi-major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	[Thorad Agena D]	1972-32A	1972 Apr 19.91 22.77 days 1972 May 12.68	Cylinder 2000?	8 long? 1.5 dia	1972 Apr 20.5	81.48	88.85	6594	155	277	0.009	171
D	Cosmos 487	1972-33A	1972 Apr 21.50 155.59 days 1972 Sep 24.09	Ellipsoid 400?	1.8 long 1.2 dia	1972 Apr 23.1 1972 Jul 1.0	70.97 70.97	92.29 91.43	6765 6723	268 255	505 435	0.018 0.013	86 -
D	Cosmos 487 rocket	1972-33B	1972 Apr 21.50 73.04 days 1972 Jul 3.54	Cylinder 1500?	8 long 1.65 dia	1972 Apr 23.9	70.96	92.14	6757	267	491	0.017	87
D	Fragment	1972-33C											
D R	Cosmos 488	1972-34A	1972 May 5.48 12.7 days 1972 May 18.2	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1972 May 6.0 1972 May 14.6	65.41 65.41	89.50 89.79	6629 6643	207 176	294 353	0.007 0.013	65 44
D	Cosmos 488 rocket	1972-34B	1972 May 5.48 6.12 days 1972 May 11.60	Cylinder 2500?	7.5 long 2.6 dia	1972 May 6.0	65.40	89.40	6624	201	290	0.007	54
D	Cosmos 488 engine*	1972-34E	1972 May 5.48 18 days 1972 May 23	Cone 600? full	1.5 long? 2 dia?	1972 May 17.2	65.41	89.65	6636	178	338	0.012	-
D	Fragments	1972-34C,D,F-H											
	Cosmos 489	1972-35A	1972 May 6.47 1200 years	Cylinder + boom? 700?	1.4 long 2.0 dia	1972 May 6.9	74.02	104.82	7364	969	1002	0.002	282
	Cosmos 489 rocket	1972-35B	1972 May 6.47 600 years	Cylinder 2200?	7.4 long 2.4 dia	1972 May 8.1	74.02	104.57	7356	965	991	0.002	286

* 1972-34E ejected from 1972-34A about 1972 May 17.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 490	1972-36A	1972 May 17.43 11.73 days 1972 May 29.16	Sphere-cylinder 5900?	5.9 long 2.4 dia	1972 May 17.8	65.42	89.39	6623	205	285	0.006	63
D	Cosmos 490 rocket	1972-36B	1972 May 17.43 5.77 days 1972 May 23.20	Cylinder 2500?	7.5 long 2.6 dia	1972 May 17.8	65.40	89.30	6619	204	277	0.005	58
D	Cosmic Ray Package C*	1972-36D	1972 May 17.43 20.35 days 1972 Jun 6.78	Ellipsoid 200?	0.9 long 1.9 dia	1972 May 27.8	65.39	89.19	6613	202	268	0.005	59
D	Fragment	1972-36C											
D	Molniya 2B	1972-37A	1972 May 19.61 1768 days 1977 Mar 22	Windmill + 6 vanes 1250?	4.2 long? 1.6 dia?	1972 May 24.6 1972 Jul 1.0 1973 Jul 1.0	65.42 65.42 65.8	705.11 720.11 716.19	26243 26614 26517	440 408 251	39290 40064 40027	0.740 0.745 0.750	285 - -
D	Molniya 2B launcher rocket	1972-37B	1972 May 19.61 20.03 days 1972 Jun 8.64	Cylinder 2500?	7.5 long 2.6 dia	1972 May 19.8	65.41	90.85	6695	217	417	0.015	62
D	Molniya 2B launcher	1972-37C	1972 May 19.61 20.77 days 1972 Jun 9.38	Irregular -	-	1972 May 19.8	65.40	91.21	6713	207	463	0.019	64
D	Molniya 2B rocket	1972-37G	1972 May 19.61 1839 days 1977 Jun 1	Cylinder 440	2.0 long 2.0 dia	1972 Jul 1.0 1973 Jun 1.0	65.3 65.7	704.07 703.38	26216 26198	453 323	39223 39317	0.739 0.744	- -
D	Fragments	1972-37D-F											

* 1972-36D ejected from 1972-36A about 1972 May 27.

Year of launch 1972 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 491	1972-38A	1972 May 25.28	Sphere-	6.5 long?	1972 May 26.6	64.98	88.95	6601	177	269	0.007	57
R			13.9 days	cylinder	2.4 dia	1972 May 30.4	64.98	89.92	6649	173	369	0.015	54
			1972 Jun 8.1	6300?									
D	Cosmos 491 rocket	1972-38B	1972 May 25.28	Cylinder	7.5 long	1972 May 26.3	64.96	89.14	6611	194	271	0.006	24
			5.47 days	2500?	2.6 dia								
			1972 May 30.75										
D	Cosmos 491 engine*	1972-38E	1972 May 25.28	Cone	1.5 long?	1972 Jun 7.4	64.97	89.49	6628	173	327	0.012	51
			17.25 days	600? full	2 dia?								
			1972 Jun 11.53										
D	Fragments	1972-38C,D,F											
D	[Thorad Agena D]	1972-39A	1972 May 25.78	Cylinder	8 long?	1972 May 26.0	96.34	89.17	6610	158	305	0.011	143
			10.20 days	2000?	1.5 dia								
			1972 Jun 4.98										
D	Cosmos 492	1972-40A	1972 Jun 9.30	Sphere-	6.5 long?	1972 Jun 9.7	64.97	89.77	6642	205	323	0.009	54
R			12.86 days	cylinder	2.4 dia	1972 Jun 15.1	64.97	89.34	6621	173	312	0.010	55
			1972 Jun 22.16	6300?									
D	Cosmos 492 rocket	1972-40B	1972 Jun 9.30	Cylinder	7.5 long	1972 Jun 10.4	64.96	89.56	6632	201	306	0.008	39
			9.10 days	2500?	2.6 dia								
			1972 Jun 18.40										
D	Cosmos 492 engine**	1972-40D	1972 Jun 9.30	Cone	1.5 long?	1972 Jun 21.6	64.96	89.35	6621	180	306	0.010	55
			18.50 days	600? full	2 dia?								
			1972 Jun 27.80										
D	Fragments	1972-40C,E											

* 1972-38E ejected from 1972-38A on 1972 Jun 7.

** 1972-40D ejected from 1972-40A on 1972 Jun 21.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Intelsat 4D (F-5)	1972-41A	1972 Jun 13.91 >million years	Cylinder 1410 full 720 empty	2.82 long 2.39 dia	1972 Jun 14.0 1972 Jul 23.0	27.00 0.15	651.4 1436.2	24937 42166	548 35782	36570 35794	0.722 0.0001	189* -
	Intelsat 4D rocket	1972-41B	1972 Jun 13.91 6000 years	Cylinder 1815	8.6 long 3.0 dia	1972 Jun 30.9	27.00	651.4	24937	548	36570	0.722	189
D R	Cosmos 493	1972-42A	1972 Jun 21.27 11.89 days 1972 Jul 3.16	Sphere-cylinder 5700?	5.0 long 2.4 dia	1972 Jun 21.5	64.98	89.25	6617	203	274	0.005	33
D	Cosmos 493 rocket	1972-42B	1972 Jun 21.27 4.44 days 1972 Jun 25.71	Cylinder 2500?	7.5 long 2.6 dia	1972 Jun 22.0	64.98	89.06	6607	195	263	0.005	26
D	Fragment	1972-42C											
	Cosmos 494	1972-43A	1972 Jun 23.39 120 years	Cylinder + paddles? 750?	2 long? 1 dia?	1972 Jun 25.8	74.06	100.83	7175	790	804	0.001	51
	Cosmos 494 rocket	1972-43B	1972 Jun 23.39 100 years	Cylinder 2200?	7.4 long 2.4 dia	1972 Jun 29.5	74.06	100.70	7169	779	803	0.002	25
	Fragments	1972-43C-E											
D R	Cosmos 495	1972-44A	1972 Jun 23.48 12.7 days 1972 Jul 6.2	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1972 Jun 24.5 1972 Jun 27.7	65.41 65.41	89.30 88.90	6618 6598	202 150	278 290	0.006 0.011	48 48
D	Cosmos 495 rocket	1972-44B	1972 Jun 23.48 5.61 days 1972 Jun 29.09	Cylinder 2500?	7.5 long 2.6 dia	1972 Jun 24.5	65.40	89.13	6610	195	268	0.006	40
D	Cosmos 495 engine**	1972-44D	1972 Jun 23.48 14.98 days 1972 Jul 8.46	Cone 600? full	1.5 long? 2 dia?	1972 Jul 7.0	65.41	88.98	6602	165	283	0.009	-
D	Fragments	1972-44C,E											

** 1972-44D ejected from 1972-44A about 1972 Jul 5.

* Approximate orbit.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 496	1972-45A	1972 Jun 26.62 6.0 days 1972 Jul 2.6	Sphere-cylinder + 2 wings 6570?	7.5 long 2.2 dia	1972 Jun 27.6	51.61	89.53	6632	187	321	0.010	85
D	Cosmos 496 rocket	1972-45B	1972 Jun 26.62 5.96 days 1972 Jul 2.58	Cylinder 2500?	7.5 long 2.6 dia	1972 Jun 26.9	51.59	89.49	6630	185	319	0.010	77
D	Fragment	1972-45C											
	Prognoz 2	1972-46A	1972 Jun 29.16 *10 years?*	Spheroid + *4 vanes* 845	1.8 dia?	Initial orbit similar to 1972-46C 1972 Aug 1.0	65.3	5849.2	107 539	517	201 804	0.936	-
D	Prognoz 2 launcher rocket	1972-46B	1972 Jun 29.16 33.51 days 1972 Aug 1.67	Cylinder 2500?	7.5 long 2.6 dia	1972 Jul 1.1	64.96	91.08	6707	230	427	0.015	64
D P	Prognoz 2* launcher	1972-46C	1972 Jun 29.16 45.08 days 1972 Aug 13.24	Irregular	-	1972 Jul 1.6	64.94	91.57	6730	235	469	0.017	66
	Prognoz 2 rocket	1972-46F	1972 Jun 29.16 10 years?	Cylinder 440	2.0 long 2.0 dia	Orbit similar to 1972-46A second orbit							
D	Fragments	1972-46D,E											
D	Intercosmos 7	1972-47A	1972 Jun 30.25 97.40 days 1972 Oct 5.65	Ellipsoid + 6 panels? 400?	1.8 long 1.2 dia	1972 Jul 1.8	48.41	92.60	6784	260	551	0.021	113
D	Intercosmos 7 rocket	1972-47B	1972 Jun 30.25 90.80 days 1972 Sep 29.05	Cylinder 1500?	8 long 1.65 dia	1972 Jul 1.8	48.42	92.35	6771	265	521	0.019	114
D	Fragment	1972-47C											

*Fragments (spheres) retrieved in Australia.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 497	1972-48A	1972 Jun 30.39 494.80 days 1973 Nov 7.19	Ellipsoid 400?	1.8 long 1.2 dia	1972 Jul 2.2 1972 Dec 16.5 1973 Jun 1.0	70.98 70.98 70.98	95.23 93.86 92.37	6908 6841 6769	271 265 252	788 661 529	0.037 0.029 0.020	80 - -
D	Cosmos 497 rocket	1972-48B	1972 Jun 30.39 259.88 days 1973 Mar 17.27	Cylinder 1500?	8 long 1.65 dia	1972 Jul 2.2 1972 Oct 1.0 1973 Jan 1.0	71.00 70.99 70.98	95.05 93.88 92.27	6899 6842 6764	273 263 251	768 664 520	0.036 0.029 0.020	80 - -
D	Fragment	1972-48C											
	Meteor 12	1972-49A	1972 Jun 30.79 500 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1972 Jul 2.5	81.22	102.95	7275	889	905	0.001	30
	Meteor 12 rocket	1972-49B	1972 Jun 30.79 400 years	Cylinder 1440	3.8 long 2.6 dia	1972 Jul 2.9	81.22	103.05	7280	865	939	0.004	177
D	Cosmos 498	1972-50A	1972 Jul 5.40 143.26 days 1972 Nov 25.66	Ellipsoid 400?	1.8 long 1.2 dia	1972 Jul 6.7 1972 Sep 16.0	70.95 70.95	92.12 91.26	6757 6715	267 256	490 418	0.017 0.012	70 -
D	Cosmos 498 rocket	1972-50B	1972 Jul 5.40 83.80 days 1972 Sep 27.20	Cylinder 1500?	8 long 1.65 dia	1972 Jul 5.8	70.95	91.95	6748	273	467	0.014	81
D R	Cosmos 499*	1972-51A	1972 Jul 6.45 10.88 days 1972 Jul 17.33	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1972 Jul 6.7	51.77	89.31	6622	204	283	0.006	39
C	Cosmos 499 rocket	1972-51B	1972 Jul 6.45 3.77 days 1972 Jul 10.22	Cylinder 2500?	7.5 long 2.6 dia	1972 Jul 7.1	51.76	89.18	6615	205	269	0.005	44
D	Cosmos 499 engine†	1972-51E	1972 Jul 6.45 14.13 days 1972 Jul 20.58	Cone 600? full	1.5 long? 2 dia?	1972 Jul 17.0	51.76	88.84	6598	171	269	0.007	76
D	Fragments	1972-51C,D											

* Manoeuvrable.

† 1972-51E ejected from 1972-51A on 1972 Jul 16.

Year of launch 1972 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	[Titan 3D]	1972-52A	1972 Jul 7.74 68 days 1972 Sep 13	Cylinder 13300? full	15 long 3.0 dia	1972 Jul 8.0	96.88	88.77	6591	174	251	0.006	162
D	Titan 3D rocket	1972-52B	1972 Jul 7.74 1.92 days 1972 Jul 9.66	Cylinder 1900	6 long 3.0 dia	1972 Jul 8.9	96.88	88.07	6556	142	213	0.005	158
D	Capsule	1972-52C	1972 Jul 7.74 2129 days 1978 May 6.	Octagon 60?	0.3 long? 0.9 dia?	1972 Jul 9.6	96.15	94.66	6879	497	504	0.0005	238
	Cosmos 500	1972-53A	1972 Jul 10.68 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1972 Jul 11.5	74.07	95.18	6905	505	549	0.003	346
	Cosmos 500 rocket	1972-53B	1972 Jul 10.68 10 years	Cylinder 2200?	7.4 long 2.4 dia	1972 Jul 12.2	74.06	95.08	6900	500	544	0.003	345
D	Fragments	1972-53C-F											
D	Cosmos 501	1972-54A	1972 Jul 12.25 666.63 days 1974 May 9.88	Ellipsoid 400?	1.8 long 1.2 dia	1972 Jul 12.5 1972 Dec 16.5 1973 Sep 1.0	48.52 48.45 48.38	109.21 105.60 100.01	7573 7406 7140	221 213 206	2168 1843 1318	0.129 0.110 0.078	105 - -
D	Cosmos 501 rocket	1972-54B	1972 Jul 12.25 333 days 1973 Jun 10	Cylinder 1500?	8 long 1.65 dia	1972 Jul 13.4 1972 Oct 16.5 1973 Feb 15.0	48.45 48.45 48.35	108.75 105.28 99.68	7550 7390 7124	215 212 207	2129 1812 1284	0.127 0.108 0.076	103 - -
D	Fragments	1972-54C-J											

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 502	1972-55A	1972 Jul 13.61	Sphere-cylinder	5.9 long	1972 Jul 14.3	65.40	89.16	6611	204	262	0.004	47
R			11.7 days	5900?	2.4 dia								
			1972 Jul 25.3										
D	Cosmos 502 rocket	1972-55B	1972 Jul 13.61	Cylinder	7.5 long	1972 Jul 14.3	65.40	89.00	6603	202	248	0.004	24
			5 days	2500?	2.6 dia								
			1972 Jul 18										
D	Capsule*	1972-55E	1972 Jul 13.61	Ellipsoid	0.9 long	1972 Jul 26.7	65.39	88.54	6580	171	233	0.005	2
			13 days	200?	1.9 dia								
			1972 Jul 26										
D	Fragments	1972-55C,D											
D	Cosmos 503	1972-56A	1972 Jul 19.58	Sphere-cylinder	6.5 long?	1972 Jul 19.9	65.43	89.40	6623	202	288	0.006	59
R			12.70 days	6300?	2.4 dia	1972 Jul 25.5	65.41	89.33	6620	169	314	0.011	51
			1972 Aug 1.28										
D	Cosmos 503 rocket	1972-56B	1972 Jul 19.58	Cylinder	7.5 long	1972 Jul 20.1	65.40	89.32	6619	207	275	0.005	53
			7.49 days	2500?	2.6 dia								
			1972 Jul 27.07										
D	Cosmos 503 engine**	1972-56E	1972 Jul 19.58	Cone	1.5 long?	1972 Jul 31.4	65.46	89.08	6607	163	295	0.010	53
			14.70 days	600? full	2 dia?								
			1972 Aug 3.28										
D	Fragments	1972-56C,D											

* 1972-55E ejected from 1972-55A on 1972 Jul 25.

** 1972-56E ejected from 1972-56A on 1972 Jul 31.

Year of launch 1972 continued

Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
Cosmos 504	1972-57A	1972 Jul 20.75 5000 years	Spheroid 40?	1.0 long? 0.8 dia?	1972 Jul 24.1	74.02	114.03	7789	1324	1498	0.011	89
Cosmos 505	1972-57B	1972 Jul 20.75 6000 years	Spheroid 40?	1.0 long? 0.8 dia?	1972 Jul 29.9	74.03	114.37	7804	1354	1498	0.009	84
Cosmos 506	1972-57C	1972 Jul 20.75 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1972 Jul 25.8	74.02	114.70	7819	1384	1498	0.007	89
Cosmos 507	1972-57D	1972 Jul 20.75 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1972 Jul 24.2	74.02	115.03	7834	1414	1498	0.005	94
Cosmos 508	1972-57E	1972 Jul 20.75 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1972 Jul 24.2	74.02	115.37	7850	1446	1497	0.003	95
Cosmos 509	1972-57F	1972 Jul 20.75 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1972 Jul 26.2	74.02	115.73	7866	1475	1501	0.002	124
Cosmos 510	1972-57G	1972 Jul 20.75 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1972 Jul 29.7	74.02	116.10	7883	1497	1512	0.001	235
Cosmos 511	1972-57H	1972 Jul 20.75 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1972 Jul 26.2	74.03	116.48	7900	1496	1548	0.003	246
Cosmos 504 rocket	1972-57J	1972 Jul 20.75 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1972 Jul 22.9	74.03	117.08	7927	1500	1598	0.006	265

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Landsat 1 (ERTS*)	1972-58A	1972 Jul 23.75 100 years	Conical skeleton + 2 paddles 816	3.0 long 1.45 dia	1972 Jul 30.9	99.12	103.27	7290	903	921	0.001	284
	Landsat 1 second stage**	1972-58B	1972 Jul 23.75	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1972 Jul 30.2	98.51	100.34	7152	637	910	0.019	221
27d	Fragments	1972-58C-HZ											
D R	Cosmos 512	1972-59A	1972 Jul 28.43 11.7 days 1972 Aug 9.1	Sphere-cylinder 5700?	5.0 long 2.4 dia	1972 Jul 30.2	65.39	89.25	6616	203	273	0.005	47
D	Cosmos 512 rocket	1972-59B	1972 Jul 28.43 4.38 days 1972 Aug 1.81	Cylinder 2500?	7.5 long 2.6 dia	1972 Jul 29.3	65.38	89.06	6607	190	267	0.006	35
D R	Cosmos 513	1972-60A	1972 Aug 2.35 12.86 days 1972 Aug 15.21	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1972 Aug 3.5 1972 Aug 4.1	64.97 64.97	89.73 89.36	6640 6621	203 174	320 312	0.009 0.010	44 56
D	Cosmos 513 rocket	1972-60B	1972 Aug 2.35 6.92 days 1972 Aug 9.27	Cylinder 2500?	7.5 long 2.6 dia	1972 Aug 3.2	64.98	89.56	6631	203	303	0.008	39
D	Cosmos 513 engine†	1972-60E	1972 Aug 2.35 22 days 1972 Aug 24	Cone 600? full	1.5 long? 2 dia?	1972 Aug 15.1	64.95	89.33	6620	161	322	0.012	55
D	Fragments	1972-60C,D,F											

* Earth Resources Technology Satellite.

† 1972-60E ejected from 1972-60A on 1972 Aug 14.

** Landsat 1 second stage disintegrated on 1975 May 22.77 near 33.3 deg South, 45.1 deg East. 1972-58B is now a fragment.

Year of launch 1972 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi-major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Explorer 46 (MTS*)	1972-61A	1972 Aug 13.63 18 years	Cylinder 175	3.2 long 0.5 dia?	1972 Sep 4.5	37.70	97.65	7030	492	811	0.023	267
1d	Fragments	1972-61B,C											
	Cosmos 514	1972-62A	1972 Aug 16.64 1200 years	Cylinder? 700?	1.3 long? 1.9 dia?	1972 Sep 3.1	82.97	104.43	7345	958	975	0.001	100
	Cosmos 514 rocket	1972-62B	1972 Aug 16.64 600 years	Cylinder 2200?	7.4 long 2.4 dia	1972 Sep 4.8	82.97	104.37	7342	952	975	0.002	94
	Fragments	1972-62C,D											
D R	Cosmos 515†	1972-63A	1972 Aug 18.42 12.76 days 1972 Aug 31.18	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1972 Aug 19.4	72.86	89.66	6635	189	325	0.010	50
D	Cosmos 515 rocket	1972-63B	1972 Aug 18.42 4.81 days 1972 Aug 23.23	Cylinder 2500?	7.5 long 2.6 dia	1972 Aug 19.5	72.88	89.13	6609	207	254	0.004	31
D	Cosmos 515 engine**	1972-63D	1972 Aug 18.42 17 days 1972 Sep 4	Cone 600? full	1.5 long? 2 dia?	1972 Sep 1.0	72.87	88.82	6593	174	256	0.006	-
D	Fragments	1972-63C,E											
??	Denpa [Mu 4S]	1972-64A	1972 Aug 19.11 8 years	Octagonal cylinder 75	0.68 long 0.71 dia	1972 Sep 2.1	31.03	156.85	9646	245	6291	0.313	175
	Denpa rocket	1972-64B	1972 Aug 19.11 10 years	Sphere-cone 90	1.86 long 0.79 dia	1973 Jan 2.3	31.02	157.55	9675	235	6358	0.316	275

* Meteoroid Technology Satellite

** 1972-63D ejected from 1972-63A on 1972 Aug 29

† Manoeuvrable

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Copernicus (OAO 3)*	1972-65A	1972 Aug 21.44 500 years	Octagonal cylinder 2220	3.05 long 2.15 dia	1972 Aug 22.1	35.01	99.49	7118	736	744	0.0006	293
	Copernicus rocket	1972-65B	1972 Aug 21.44 200 years	Cylinder 1815	8.6 long 3.0 dia	1972 Sep 4.4	35.02	99.44	7116	695	780	0.006	350
	Fragment	1972-65C											
	Cosmos 516**	1972-66A	1972 Aug 21.44 600 years	Cone-cylinder	6 long? 2 dia?	1972 Sep 1.5 1972 Oct 1.7	64.98 64.82	89.64 104.57	6635 7353	251 920	263 1030	0.0009 0.007	260 343
D	Cosmos 516 rocket	1972-66B	1972 Aug 21.44 35.26 days 1972 Sep 25.70	Cylinder 1500?	8 long? 2.5 dia?	1972 Sep 23.1	64.98	89.44	6625	239	255	0.001	312
D	Cosmos 516 platform	1972-66C	1972 Aug 21.44 60 days 1972 Oct 20	Irregular	-	1972 Sep 24.9	64.98	89.52	6629	243	259	0.001	270
D R	Cosmos 517	1972-67A	1972 Aug 30.35 11.86 days 1972 Sep 11.21	Sphere-cylinder 5700?	5.0 long 2.4 dia	1972 Aug 31.1	64.98	89.42	6624	204	288	0.006	39
D	Cosmos 517 rocket	1972-67B	1972 Aug 30.35 4.51 days 1972 Sep 3.86	Cylinder 2500?	7.5 long 2.6 dia	1972 Aug 31.2	65.00	89.15	6611	197	268	0.005	25
D	Fragment	1972-67C											
D	[Titan 3B Agena D]	1972-68A	1972 Sep 1.74 29 days 1972 Sep 30	Cylinder 3000?	8 long? 1.5 dia	1972 Sep 2.0	110.50	89.71	6638	140	380	0.018	147

* Orbiting Astronomical Observatory

** 1972-66B and 66C attached to 1972-66A until orbit change about 1972 Sep 21.93

Year of launch 1972 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	TRIAD 1 [Scout]	1972-69A	1972 Sep 2.74 90 years	Dumb-bell 94	7.3 long 0.59 dia	1972 Sep 4.5	90.14	100.68	7168	716	863	0.010	352
	Altair rocket	1972-69B	1972 Sep 2.74 70 years	Cylinder 24	1.50 long 0.46 dia	1972 Sep 4.2	90.13	100.70	7169	738	843	0.007	338
	Fragment	1972-69C											
D R	Cosmos 518	1972-70A	1972 Sep 15.40 8.85 days 1972 Sep 24.25	Sphere-cylinder 5900?	5.9 long 2.4 dia	1972 Sep 16.2	72.84	89.64	6634	204	307	0.008	59
D	Cosmos 518 rocket	1972-70B	1972 Sep 15.40 7.10 days 1972 Sep 22.50	Cylinder 2500?	7.5 long 2.6 dia	1972 Sep 16.2	72.83	89.46	6625	199	295	0.007	47
D	Capsule*	1972-70C	1972 Sep 15.40 12 days 1972 Sep 27	Ellipsoid 200?	0.9 long 1.9 dia	1972 Sep 23.7	72.85	89.30	6617	200	278	0.006	37
D R	Cosmos 519†	1972-71A	1972 Sep 16.35 9.90 days 1972 Sep 26.25	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1972 Sep 18.2	71.33	90.19	6662	207	360	0.012	47
D	Cosmos 519 rocket	1972-71B	1972 Sep 16.35 8.35 days 1972 Sep 24.70	Cylinder 2500?	7.5 long 2.6 dia	1972 Sep 18.0	71.36	89.56	6630	201	302	0.008	41
D	Cosmos 519 engine**	1972-71D	1972 Sep 16.35 28 days 1972 Oct 14	Cone 600? full	1.5 long? 2 dia?	1972 Oct 1.0	71.2	89.76	6640	200	323	0.009	-
D	Fragments	1972-71C,E											

*1972-70C ejected from 1972-70A on 1972 Sep 23.
**1972-71D ejected from 1972-71A on 1972 Sep 25.

† Manoeuvrable

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 520	1972-72A	1972 Sep 19.81 30 years	Windmill + 6 vanes 1250?	4.2 long? 1.6 dia?	1972 Sep 20.0 1972 Dec 30.7	62.88 62.89	93.52 715.02	6826 26488	227 750	669 39470	0.032 0.731	113 319
D	Cosmos 520 launcher rocket	1972-72B	1972 Sep 19.81 30.64 days 1972 Oct 20.45	Cylinder 2500?	7.5 long 2.6 dia	1972 Sep 21.3	62.89	92.92	6796	187	649	0.034	118
D	Cosmos 520 launcher	1972-72C	1972 Sep 19.81 47 days 1972 Nov 5	Irregular	-	1972 Sep 22.4	62.82	92.78	6789	214	607	0.029	119
	Cosmos 520 rocket	1972-72E	1972 Sep 19.81 30 years	Cylinder 440	2.0 long 2.0 dia	1973 Jan 1.0	62.89	706.77	26283	750	39059	0.729	-
D	Fragment	1972-72D											
T	Explorer 47 (Imp 9)	1972-73A	1972 Sep 23.06 > million years	16-sided cylinder 390 full	1.58 long 1.35 dia	1972 Sep 23.1 1972 Sep 25.6	28.63 17.23	7349.9 17670	125 223 224 740	260 201 100	237 429 235 600	0.947 0.077	141 76
D	Explorer 47 second stage	1972-73B	1972 Sep 23.06 3 days 1972 Sep 26	Cylinder 350?	4.9 long 1.43 dia	1972 Sep 23.1	28.8	90.02	6660	153	411	0.019	-
D	Explorer 47 third stage	1972-73C	1972 Sep 23.06 1245 days? 1976 Feb 20?	Sphere-cone 66	1.32 long 0.94 dia	1972 Oct 1.0	28.8	7780.3	130 064	246	247 125	0.949	142
D	Fragments	1972-73D,E											
	Cosmos 521	1972-74A	1972 Sep 29.84 1200 years	Cylinder?	4 long? 2 dia?	1972 Sep 30.2	65.89	104.97	7372	965	1022	0.004	194
	Cosmos 521 rocket	1972-74B	1972 Sep 29.84 600 years	Cylinder 2200?	7.4 long 2.4 dia	1972 Sep 30.3	65.83	104.87	7367	975	1002	0.002	281
	Fragment	1972-74C											

Year of launch 1972 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi-major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Molniya 2C	1972-75A	1972 Sep 30.85 1930 days 1978 Jan 12	Windmill + 6 vanes? 1250?	4.2 long? 1.6 dia?	1972 Oct 9.2 1972 Nov 1.0	65.63 65.3	703.2 717.50	26192 26550	392 551	39240 39792	0.742 0.739	284 -
D	Molniya 2C launcher rocket	1972-75B	1972 Sep 30.85 26 days 1972 Oct 26	Cylinder 2500?	7.5 long 2.6 dia	1972 Oct 1.3	65.42	91.34	6719	216	466	0.019	68
D	Molniya 2C launcher	1972-75C	1972 Sep 30.85 32.14 days 1972 Nov 1.99	Irregular	-	1972 Oct 3.1	65.39	91.48	6726	230	466	0.017	71
D	Molniya 2C rocket	1972-75D	1972 Sep 30.85 1970 days 1978 Feb 21	Cylinder 440	2.0 long 2.0 dia	1973 Jan 1.0	65.4	700.58	26130	517	38987	0.736	-
	Radcat* [Atlas Burner 2]	1972-76A	1972 Oct 2.84 20 years	Cylinder 208	12.2 long 3.05 dia	1972 Oct 5.7	98.44	99.64	7118	731	749	0.001	265
T	Radsat**	1972-76B	1972 Oct 2.84 20 years	726	- 1.7 dia?	1972 Oct 5.7	98.45	99.69	7121	732	753	0.001	245
	Burner 2 rocket	1972-76C	1972 Oct 2.84 20 years	Sphere-cone 66	1.32 long 0.94 dia	1972 Oct 20.9	98.44	99.66	7119	731	751	0.001	202
	Fragments	1972-76D, E											
D R	Cosmos 522	1972-77A	1972 Oct 4.50 12.78 days 1972 Oct 17.28	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1972 Oct 6.4 1972 Oct 15.3	72.83 72.84	89.74 89.99	6639 6651	206 178	316 368	0.008 0.014	62 37
D	Cosmos 522 rocket	1972-77B	1972 Oct 4.50 9.66 days 1972 Oct 14.16	Cylinder 2500?	7.5 long 2.6 dia	1972 Oct 6.4	72.84	89.43	6624	198	294	0.007	56

*Radar calibration target.

**Contains experiments on ultraviolet and gamma radiation.

1972-77 continued on page 310

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 522 engine*	1972-77C	1972 Oct 4.50 19.51 days 1972 Oct 24.01	Cone 600? full	1.5 long? 2 dia?	1972 Oct 16.3	72.82	90.03	6653	180	370	0.014	35
D	Fragment	1972-77D											
D	Cosmos 523	1972-78A	1972 Oct 5.48 153.49 days 1973 Mar 7.97	Ellipsoid 400?	1.8 long 1.2 dia	1972 Oct 8.2 1972 Dec 16.5	71.03 71.03	92.09 91.22	6755 6713	272 257	481 413	0.015 0.012	73 -
D	Cosmos 523 rocket	1972-78B	1972 Oct 5.48 62.92 days 1972 Dec 7.40	Cylinder 1500?	8 long 1.65 dia	1972 Oct 6.0	71.03	91.88	6744	272	460	0.014	81
D	Fragments	1972-78C-M											
D	[Titan 3D]	1972-79A	1972 Oct 10.75 90 days 1973 Jan 8	Cylinder 13300? full	15 long 3.0 dia	1972 Oct 11.5 1972 Oct 21.5	96.47 96.46	88.93 88.84	6599 6594	160 164	281 267	0.009 0.008	186 157
D	Titan 3D rocket	1972-79B	1972 Oct 10.75 2.09 days 1972 Oct 12.84	Cylinder 1900	6 long 3.0 dia	1972 Oct 11.4	96.47	88.59	6582	150	257	0.008	185
T?	Capsule	1972-79C	1972 Oct 10.75 10000 years	Octagon 60?	0.3 long? 0.9 dia?	1973 Sep 8.9	95.62	114.79	7824	1423	1469	0.003	204
	Fragments	1972-79D,E											
D	Cosmos 524	1972-80A	1972 Oct 11.56 164.64 days 1973 Mar 25.20	Ellipsoid 400?	1.8 long 1.2 dia	1972 Oct 12.8 1973 Jan 1.0	70.99 70.99	92.33 91.37	6767 6721	267 251	512 434	0.018 0.014	86 -
D	Cosmos 524 rocket	1972-80B	1972 Oct 11.56 69.92 days 1972 Dec 20.48	Cylinder 1500?	8 long 1.65 dia	1972 Oct 12.8	70.99	92.08	6754	265	488	0.017	89

*1972-77C ejected from 1972-77A on 1972 Oct 16.

Year of launch 1972 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Molniya 1W	1972-81A	1972 Oct 14.26 1844 days 1977 Nov 1	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1972 Oct 14.4 1972 Oct 16.0 1972 Nov 2.0	65.41 65.3 65.30	91.61 706.18 717.81	6732 26268 26557	226 480 636	481 39300 39722	0.019 0.739 0.736	65 285* 284
D	Molniya 1W launcher rocket	1972-81B	1972 Oct 14.26 21.65 days 1972 Nov 4.91	Cylinder 2500?	7.5 long 2.6 dia	1972 Oct 15.3	65.42	91.30	6717	211	467	0.019	60
D	Molniya 1W launcher	1972-81C	1972 Oct 14.26 33.23 days 1972 Nov 16.49	Irregular	-	1972 Oct 15.2	65.39	91.65	6734	223	488	0.020	72
D	Molniya 1W rocket	1972-81E	1972 Oct 14.26 883.47 days 1975 Mar 16.73	Cylinder 440	2.0 long 2.0 dia	1972 Dec 12.3	65.53	701.40	26152	474	39074	0.738	284
D	Fragment	1972-81D											
	NOAA 2 (ITOS)	1972-82A	1972 Oct 15.72 10000 years	Box 334	1.25 long 1.02 square	1972 Oct 16.1	101.77	115.01	7833	1451	1458	0.0004	223
T	Oscar 6	1972-82B	1972 Oct 15.72 10000 years	Rectangular box 16	0.43 x 0.30 x 0.15	1972 Oct 16.4	101.76	115.01	7833	1450	1459	0.0006	239
	NOAA 2 second stage	1972-82C	1972 Oct 15.72 1000 years	Cylinder 350?	4.9 long 1.43 dia	1972 Oct 23.9	102.80	109.36	7575	918	1475	0.037	306
D R	Cosmos 525	1972-83A	1972 Oct 18.50 10.71 days 1972 Oct 29.21	Sphere-cylinder 5900?	5.9 long 2.4 dia	1972 Oct 19.0	65.39	89.25	6616	207	269	0.005	66
D	Cosmos 525 rocket	1972-83B	1972 Oct 18.50 4.25 days 1972 Oct 22.75	Cylinder 2500?	7.5 long 2.6 dia	1972 Oct 19.2	65.39	89.14	6611	198	267	0.005	43

*Approximate orbit.

1972-83 continued on page 312

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Capsule*	1972-83C	1972 Oct 18.50 14.47 days 1972 Nov 1.97	Ellipsoid 200?	0.9 long 1.9 dia	1972 Oct 27.3	65.38	89.01	6604	192	260	0.005	38
D	Fragment	1972-83D											
D	Cosmos 526	1972-84A	1972 Oct 25.45 165 days 1973 Apr 8	Ellipsoid 400?	1.8 long 1.2 dia	1972 Oct 26.1 1973 Jan 16.5	70.96 70 96	92.15 91.26	6758 6715	273 256	486 418	0.016 0.012	73 -
D	Cosmos 526 rocket	1972-84B	1972 Oct 25.45 75.16 days 1973 Jan 8.61	Cylinder 1500?	8 long 1.65 dia	1972 Oct 26.1	70.96	91.93	6747	273	465	0.014	71
	Meteor 13	1972-85A	1972 Oct 26.92 500 years	Cylinder + 2 vanes 2200?	5 long? 1.5 dia?	1972 Oct 28.5	81.27	102.57	7257	867	891	0.002	264
	Meteor 13 rocket	1972-85B	1972 Oct 26.92 400 years	Cylinder 1440	3.8 long 2.6 dia	1972 Oct 28.8	81.27	102.67	7262	841	927	0.006	185
D	Cosmos 527	1972-86A	1972 Oct 31.57 12.7 days 1972 Nov 13.3	Sphere- cylinder 6300?	6.5 long? 2.4 dia	1972 Oct 31.8 1972 Nov 2.3	65.37 65.40	89.62 89.11	6635 6609	207 178	306 284	0.007 0.008	80 47
R													
D	Cosmos 527 rocket	1972-86B	1972 Oct 31.57 7.95 days 1972 Nov 8.52	Cylinder 2500?	7.5 long 2.6 dia	1972 Oct 31.8	65.39	89.51	6629	207	295	0.007	75
D	Cosmos 527 engine**	1972-86E	1972 Oct 31.57 18 days 1972 Nov 18	Cone 600? full	1.5 long? 2 dia?	1972 Nov 12.7	65.43	89.53	6630	181	323	0.011	46
D	Fragments	1972-86C,D,F											

* 1972-83C ejected from 1972-83A on 1972 Oct 26.43

** 1972-86E ejected from 1972-86A on 1972 Nov 12.

Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
Cosmos 528	1972-87A	1972 Nov 1.08 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1972 Nov 4.6	74.03	114.21	7797	1368	1470	0.007	93
Cosmos 529	1972-87B	1972 Nov 1.08 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1972 Nov 4.6	74.03	114.61	7815	1404	1470	0.004	96
Cosmos 530	1972-87C	1972 Nov 1.08 6000 years	Spheroid 40?	1.0 long? 0.8 dia?	1972 Nov 3.3	74.03	113.85	7781	1336	1469	0.009	92
Cosmos 531	1972-87D	1972 Nov 1.08 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1972 Nov 3.9	74.03	114.83	7825	1423	1471	0.003	110
Cosmos 532	1972-87E	1972 Nov 1.08 4000 years	Spheroid 40?	1.0 long? 0.8 dia?	1972 Nov 3.3	74.04	113.49	7764	1302	1470	0.011	90
Cosmos 533	1972-87F	1972 Nov 1.08 5000 years	Spheroid 40?	1.0 long? 0.8 dia?	1972 Nov 4.3	74.03	113.68	7773	1319	1470	0.010	95
Cosmos 534	1972-87G	1972 Nov 1.08 6000 years	Spheroid 40?	1.0 long? 0.8 dia?	1972 Nov 5.5	74.04	114.03	7789	1351	1470	0.008	91
Cosmos 535	1972-87H	1972 Nov 1.08 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1972 Nov 2.2	74.04	114.42	7806	1385	1471	0.006	102
Cosmos 528 rocket	1972-87J	1972 Nov 1.08 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1972 Nov 3.6	74.03	116.70	7910	1470	1594	0.008	267

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 536	1972-88A	1972 Nov 3.07 10 years	Cylinder + paddles? 900?	2 long? 1 dia?	1972 Nov 4.2	74.02	95.27	6909	518	544	0.002	15
	Cosmos 536 rocket	1972-88B	1972 Nov 3.07 10 years	Cylinder 2200?	7.4 long 2.4 dia	1972 Nov 4.3	74.02	95.16	6904	508	543	0.002	11
1d	Fragments	1972-88C,D											
T	[Thor Burner 2]†	1972-89A	1972 Nov 9.21 80 years	12-faced frustum 195	1.64 long 1.31 to 1.10 dia	1972 Nov 20.6	98.65	101.80	7221	813	872	0.004	200
	Burner 2 rocket	1972-89B	1972 Nov 9.21 60 years	Sphere-cone 66	1.32 long 0.94 dia	1972 Nov 10.7	98.64	101.82	7222	816	871	0.004	221
T	Telesat 1 (Anik 1)	1972-90A	1972 Nov 10.05 >million years	Cylinder 562 full 295 empty	1.52 long 1.83 dia	1972 Dec 1.0 1973 Jan 1.0	0.4 0.1	1455.5 1436.0	42543 42164	35822 35780	36508 35791	0.008 0.0001	- -
D	Telesat 1 second stage	1972-90B	1972 Nov 10.05 178.31 days 1973 May 7.36	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1972 Nov 10.1 1973 Feb 15.0	28.57 28.57	103.78 98.45	7319 7066	203 181	1678 1194	0.101 0.072	183 -
	Telesat 1 third stage	1972-90C	1972 Nov 10.05 20 years?	Sphere-cone 66	1.32 long 0.94 dia	1972 Nov 10.1	28.57	645.3	24734	203	36508	0.734	181*
	Explorer 48 (SAS 2)	1972-91A	1972 Nov 15.93 9 years	Cylinder + 4 paddles 186	1.29 long 0.55 dia	1972 Nov 17.0	1.90	95.20	6916	444	632	0.014	79
	Explorer 48 rocket	1972-91B	1972 Nov 15.93 8 years?	Cylinder 24	1.50 long 0.46 dia	1972 Nov 16.7 1973 Aug 27.8	1.84 1.90	95.12 94.68	6912 6890	450 430	618 594	0.013 0.012	71* 76

* Approximate orbits. Telesat 1 is Canadian.

†DMSP

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	ESRO 4	1972-92A	1972 Nov 22.01 509.20 days 1974 Apr 15.21	Cylinder 114	0.90 long 0.76 dia	1972 Nov 22.9 1973 May 1.0 1973 Oct 1.0	91.11 91.09 91.09	99.00 96.99 95.15	7087 6989 6902	245 240 234	1173 982 814	0.065 0.053 0.042	174 - -
D	ESRO 4 rocket	1972-92B	1972 Nov 22.01 229.77 days 1973 Jul 9.78	Cylinder 24	1.50 long 0.46 dia	1972 Nov 24.1 1973 Mar 16.5	91.11 91.09	98.93 95.92	7084 6939	244 232	1168 889	0.065 0.047	169 -
D R	Cosmos 537	1972-93A	1972 Nov 25.38 11.8 days 1972 Dec 7.2	Sphere-cylinder 5700?	5.0 long 2.4 dia	1972 Nov 26.2	64.95	89.59	6633	204	305	0.008	41
D	Cosmos 537 rocket	1972-93B	1972 Nov 25.38 6.93 days 1972 Dec 2.31	Cylinder 2500?	7.5 long 2.6 dia	1972 Nov 25.9	64.97	89.49	6628	201	298	0.007	35
D	Intercosmos 8	1972-94A	1972 Nov 30.91 91.76 days 1973 Mar 2.67	Ellipsoid + 6 panels? 400?	1.8 long 1.2 dia	1972 Dec 2.3	71.01	93.11	6805	204	649	0.033	85
D	Intercosmos 8 rocket	1972-94B	1972 Nov 30.91 42.70 days 1973 Jan 12.61	Cylinder 1500?	8 long 1.65 dia	1972 Dec 2.3	71.01	92.95	6797	206	631	0.031	87
D	Fragment	1972-94C											

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Molniya 1X	1972-95A	1972 Dec 2.20 1166 days 1976 Feb 11	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1972 Dec 31.9 1973 Sep 1.0	65.01 65.01	717.70 717.74	26554 26555	555 582	39797 39772	0.739 0.738	285 -
D	Molniya 1X launcher rocket	1972-95B	1972 Dec 2.20 39.72 days 1973 Jan 10.92	Cylinder 2500?	7.5 long 2.6 dia	1972 Dec 4.2	64.98	91.23	6714	230	441	0.016	64
D	Molniya 1X launcher	1972-95C	1972 Dec 2.20 62.08 days 1973 Feb 2.28	Irregular	-	1972 Dec 3.1	64.98	91.93	6749	210	531	0.024	60
D	Molniya 1X rocket	1972-95F	1972 Dec 2.20 815 days 1975 Feb 25	Cylinder 440	2.0 long 2.0 dia	1973 Mar 1.0 1973 Sep 1.0	65.00 64.99	699.14 699.18	26094 26095	545 571	38887 38863	0.735 0.734	- -
D	Fragments	1972-95D, E											
D	Apollo 17**	1972-96A	1972 Dec 7.23	Cone-cylinder	11.15 long	1972 Dec 7.3	32.56	87.82	6552	169	178	0.0007	- *
R			12.58 days	30340	3.91 dia	1972 Dec 7.5	33.2	26320	292 520	200	572 080	0.977	30*
3M			1972 Dec 19.81	full		In selenocentric orbit 1972 Dec 10.83 to Dec 16.98							
D	Saturn IVB [Saturn 512]	1972-96B	1972 Dec 7.23	Cylinder	18.7 long	1972 Dec 7.3	32.56	87.82	6552	169	178	0.0007	- *
			3.63 days	13930	6.6 dia	1972 Dec 7.5	33.2	26320	292 520	200	572 080	0.977	30*
			1972 Dec 10.86			Crashed on Moon 1972 Dec 10.86							
D	LEM 12 descent stage	1972-96D	1972 Dec 7.23	Octagon + legs	1.57 high	1972 Dec 7.5	33.2	26320	292 520	200	572 080	0.977	30*
			4.60 days	11390 full	3.13 wide	Entered selenocentric orbit 1972 Dec 10.83							
			1972 Dec 11.83	2792 empty		Landed on Moon 1972 Dec 11.83							
D	LEM 12 † ascent stage	1972-96C	1972 Dec 7.23	Box + tanks	2.52 high	1972 Dec 7.5	33.2	26320	292 520	200	572 080	0.977	30*
			8.06 days	5050 full	3.76 wide	On Moon's surface 1972 Dec 11.83 to Dec 14.96							
			1972 Dec 15.29	2145 empty	3.13 deep	Finally crashed on Moon 1972 Dec 15.29							

** Apollo attached to LEM separated from Saturn IVB on Dec 7.41.

† LEM with two crew members separated from Apollo on Dec 11.72.

Ascent stage relaunched from Moon Dec 14.96; briefly docked with Apollo Dec 15.04.

* Approximate orbits.

Year of launch 1972 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Nimbus 5	1972-97A	1972 Dec 11.33 1600 years	Conical skeleton 770	3.00 long 1.45 dia	1972 Dec 14.0	99.95	107.25	7474	1089	1102	0.0008	230
	Nimbus 5 second stage	1972-97B	1972 Dec 11.33 1600 years	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1972 Dec 11.7 1973 Jan 1.0	99.93 99.8	107.34 111.8	7478 7690	1088 1105	1112 1518	0.002 0.027	214 -
D	Molniya 2D	1972-98A	1972 Dec 12.29 771 days 1975 Jan 22	Windmill + 6 vanes? 1250?	4.2 long? 1.6 dia?	1972 Dec 12.3 1973 Jan 2.5 1974 Feb 1.0	65.26 65.31 65.42	706.48 717.67 717.53	26276 26554 26550	495 465 358	39300 39886 39986	0.738 0.742 0.746	285 285 -
D	Molniya 2D launcher rocket	1972-98B	1972 Dec 12.29 31.71 days 1973 Jan 13.00	Cylinder 2500?	7.5 long 2.6 dia	1972 Dec 16.0	65.41	91.14	6709	218	444	0.017	63
D	Molniya 2D launcher	1972-98C	1972 Dec 12.29 38.24 days 1973 Jan 19.53	Irregular	-	1972 Dec 16.0	65.39	91.39	6721	220	467	0.018	64
D	Molniya 2D rocket	1972-98D	1972 Dec 12.29 664 days 1974 Oct 7	Cylinder 440	2.0 long 2.0 dia	1973 Jan 31.5 1973 Jul 1.0	65.38 65.40	702.02 701.90	26166 26163	441 484	39135 39086	0.739 0.738	284 -
D R	Cosmos 538	1972-99A	1972 Dec 14.58 12.7 days 1972 Dec 27.3	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1972 Dec 15.6 1972 Dec 16.5	65.40 65.43	89.38 89.16	6622 6611	205 184	283 282	0.006 0.007	60 58
D	Cosmos 538 rocket	1972-99B	1972 Dec 14.58 8.24 days 1972 Dec 22.82	Cylinder 2500?	7.5 long 2.6 dia	1972 Dec 15.1	65.40	89.24	6615	199	275	0.006	48

1972-99 continued on page 318

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 538 engine*	1972-99E	1972 Dec 14.58 21 days 1973 Jan 4	Cone 600? full	1.5 long? 2 dia?	1972 Dec 30.2	65.40	89.12	6609	177	285	0.008	41
D	Fragments	1972-99C,D											
D	Aeros (GRS B)†	1972-100A	1972 Dec 16.48 248.91 days 1973 Aug 22.39	Cylinder 127	0.74 long 0.91 dia	1972 Dec 18.1 1973 Apr 1.0	96.94 96.94	95.57 93.65	6923 6830	223 217	867 687	0.047 0.034	162 -
D	Aeros rocket	1972-100B	1972 Dec 16.48 71.45 days 1973 Feb 25.93	Cylinder 24	1.50 long 0.46 dia	1972 Dec 18.4	96.94	95.50	6920	224	859	0.046	161
T	BMEWS 5 [Atlas Agena D]	1972-101A	1972 Dec 20.07? > million years	Cylinder? 700 full? 350 empty?	1.7 long? 1.4 dia?	1973 Jan 1.0	9.7	1440.4	42248	31012	40728	0.115	-
	Agena D rocket	1972-101B	1972 Dec 20.07? 10 years?	Cylinder 700?	6 long? 1.5 dia?	1973 Feb 1.0	28.12	583.76	23163	200	33370	0.716	210**
	Cosmos 539	1972-102A	1972 Dec 21.08 5000 years	- 500?	-	1972 Dec 28.1	74.02	112.98	7741	1343	1383	0.003	225
	Cosmos 539 rocket	1972-102B	1972 Dec 21.08 4000 years	Cylinder 2200?	7.4 long 2.4 dia	1972 Dec 28.2	74.02	112.85	7735	1339	1374	0.002	205

*1972-99E ejected from 1972-99A about 1972 Dec 26.

**Aproximate orbit.

†German Research Satellite.

Year of launch 1972 concluded

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	[Titan 3B Agena D]	1972-103A	1972 Dec 21.74 33 days 1973 Jan 23	Cylinder 3000?	8 long? 1.5 dia	1972 Dec 25.7 1972 Dec 25.9	110.45 110.44	89.68 89.81	6637 6643	139 132	378 398	0.018 0.020	151 153
	Cosmos 540	1972-104A	1972 Dec 25.96 120 years	Cylinder + paddles 750?	2 long? 1 dia?	1972 Dec 29.2	74.08	100.79	7174	781	810	0.002	348
	Cosmos 540 rocket	1972-104B	1972 Dec 25.96 100 years	Cylinder 2200?	7.4 long 2.4 dia	1972 Dec 27.1	74.07	100.60	7164	769	803	0.002	19
	Fragments	1972-104C-E											
D R	Cosmos 541	1972-105A	1972 Dec 27.44 11.9 days 1973 Jan 8.3	Sphere-cylinder 5900?	5.9 long 2.4 dia	1972 Dec 28.7	81.31	90.21	6662	221	346	0.009	72
D	Cosmos 541 rocket	1972-105B	1972 Dec 27.44 16.33 days 1973 Jan 12.77	Cylinder 2500?	7.5 long 2.6 dia	1972 Dec 28.3	81.33	90.10	6656	218	338	0.009	63
D	Capsule*	1972-105F	1972 Dec 27.44 19 days 1973 Jan 15	Ellipsoid 200?	0.9 long 1.9 dia	1973 Jan 9.2	81.32	89.97	6650	220	323	0.008	25
D	Fragments	1972-105C-E											
	Cosmos 542	1972-106A	1972 Dec 28.46 20 years	Cylinder + 2 vanes? 2500?	5 long? 1.5 dia?	1972 Dec 31.0	81.22	96.38	6962	527	641	0.008	265
	Cosmos 542 rocket	1972-106B	1972 Dec 28.46 20 years	Cylinder 1440	3.8 long 2.6 dia	1972 Dec 31.2	81.21	96.40	6963	509	661	0.011	224

*1972-105F ejected from 1972-105A about 1973 Jan 8.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Luna 21	1973-01B	1973 Jan 8.29	Cylinder	12 long?	1973 Jan 9.0	51.55	88.68	6591	190	235	0.003	318
	launcher rocket		4 days	4000?	4 dia								
			1973 Jan 12										
D	Luna 21	1973-01C	1973 Jan 8.29	-	-	1973 Jan 9.3	51.55	88.62	6588	183	236	0.004	324
	launcher		5 days										
			1973 Jan 13										
D	Cosmos 543	1973-02A	1973 Jan 11.42	Sphere-	6.5 long?	1973 Jan 12.0	64.98	89.62	6634	203	309	0.008	54
R			12.9 days	cylinder	2.4 dia	1973 Jan 13.6	64.97	89.28	6618	175	304	0.010	47
			1973 Jan 24.3	6300?									
D	Cosmos 543	1973-02B	1973 Jan 11.42	Cylinder	7.5 long	1973 Jan 12.1	64.98	89.51	6629	203	299	0.007	53
	rocket		11 days	2500?	2.6 dia								
			1973 Jan 22										
D	Cosmos 543	1973-02C	1973 Jan 11.42	Cone	1.5 long?	1973 Jan 23.7	64.98	89.06	6607	167	290	0.009	40
	engine*		16.76 days	600? full	2 dia?								
			1973 Jan 28.18										
D	Fragment	1973-02D											
	Cosmos 544	1973-03A	1973 Jan 20.15	Cylinder +	2 long?	1973 Jan 26.2	74.03	95.23	6907	510	548	0.003	345
			8 years	paddles? 900?	1 dia?								
	Cosmos 544	1973-03B	1973 Jan 20.15	Cylinder	7.4 long	1973 Jan 20.8	74.03	95.11	6901	501	545	0.003	0
	rocket		7 years	2200?	2.4 dia								
D	Fragments	1973-03C,D											

Space Vehicle: Luna 21, 1973-01A

*1973-02C ejected from 1973-02A on 1973 Jan 23

Year of launch 1973 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 545	1973-04A	1973 Jan 24.49 188.41 days 1973 Jul 31.90	Ellipsoid 400?	1.8 long 1.2 dia	1973 Jan 25.2 1973 May 1.0	71.00 71.00	92.20 91.24	6760 6714	269 252	495 420	0.017 0.013	84 -
D	Cosmos 545 rocket	1973-04B	1973 Jan 24.49 86.75 days 1973 Apr 21.24	Cylinder 1500?	8 long 1.65 dia	1973 Jan 25.2	71.01	92.03	6752	272	475	0.015	85
	Cosmos 546	1973-05A	1973 Jan 26.49 50 years	-	-	1973 Jan 29.6	50.66	96.51	6973	575	614	0.003	46
	Cosmos 546 rocket	1973-05B	1973 Jan 26.49 30 years	Cylinder 2200?	7.4 long 2.4 dia	1973 Jan 29.0	50.66	96.42	6968	566	614	0.003	41
D R	Cosmos 547	1973-06A	1973 Feb 1.36 11.8 days 1973 Feb 13.2	Sphere-cylinder 5700?	5.0 long 2.4 dia	1973 Feb 2.2	64.97	89.63	6635	203	310	0.008	51
D	Cosmos 547 rocket	1973-06B	1973 Feb 1.36 8.5 days 1973 Feb 9.9	Cylinder 2500?	7.5 long 2.6 dia	1973 Feb 2.2	64.97	89.43	6625	204	289	0.006	41
D	Fragment	1973-06C											

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi-major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Molniya 1Y	1973-07A	1973 Feb 3.25 1723 days 1977 Oct 23	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1973 Feb 8.7 1973 Mar 1.0	65.00 65.00	703.15 717.65	26194 26553	470 578	39164 39772	0.739 0.738	285 -
D	Molniya 1Y launcher rocket	1973-07B	1973 Feb 3.25 37.83 days 1973 Mar 13.08	Cylinder 2500?	7.5 long 2.6 dia	1973 Feb 6.0	64.97	91.23	6714	229	442	0.016	64
D	Molniya 1Y launcher	1973-07C	1973 Feb 3.25 42.79 days 1973 Mar 18.04	Irregular	-	1973 Feb 5.1	64.96	91.53	6728	228	472	0.018	67
D	Molniya 1Y rocket	1973-07E	1973 Feb 3.25 2008 days 1978 Aug 4	Cylinder 440	2.0 long 2.0 dia	1973 Mar 1.0	65.10	702.53	26179	508	39093	0.737	-
D	Fragment	1973-07D											
D	Cosmos 548	1973-08A	1973 Feb 8.56	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1973 Feb 9.2	65.38	89.55	6631	205	300	0.007	72
R			12.7 days 1973 Feb 21.3			1973 Feb 14.1	65.39	89.37	6622	171	317	0.011	48
D	Cosmos 548 rocket	1973-08B	1973 Feb 8.56 8.12 days 1973 Feb 16.68	Cylinder 2500?	7.5 long 2.6 dia	1973 Feb 9.0	65.38	89.40	6624	202	289	0.007	60
D	Cosmos 548 engine *	1973-08F	1973 Feb 8.56 18 days 1973 Feb 26	Cone 600? full	1.5 long? 2 dia?	1973 Feb 21.6	65.42	90.61	6684	159	453	0.022	7
D	Fragments	1973-08C-E,G											

* 1973-08F ejected from 1973-08A about 1973 Feb 20.

Year of launch 1973 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Prognoz 3	1973-09A	1973 Feb 15.05 10 years?	Spheroid + 4 vanes 845	1.8 dia?	1973 Feb 15.0	65.0	5783	106 670	590	200 000	0.935	- *
D	Prognoz 3 launcher rocket	1973-09B	1973 Feb 15.05 35.69 days 1973 Mar 22.74	Cylinder 2500?	7.5 long 2.6 dia	1973 Feb 15.9	65.00	91.24	6714	229	442	0.016	64
D	Prognoz 3 launcher	1973-09C	1973 Feb 15.05 36.25 days 1973 Mar 23.30	Irregular	-	1973 Feb 15.9	65.03	91.53	6728	216	484	0.020	67
	Prognoz 3 rocket	1973-09D	1973 Feb 15.05 10 years?	Cylinder 440	2.0 long 2.0 dia	Orbit similar to 1973-09A							
	Cosmos 549	1973-10A	1973 Feb 28.19 8 years	Cylinder + paddles? 900?	2 long? 1 dia?	1973 Mar 1.1	74.02	95.23	6907	513	545	0.002	357
	Cosmos 549 rocket	1973-10B	1973 Feb 28.19 7 years	Cylinder 2200?	7.4 long 2.4 dia	1973 Mar 1.6	74.02	95.11	6901	504	542	0.003	4
D	Fragment	1973-10C											
D	Cosmos 550	1973-11A	1973 Mar 1.53 9.8 days 1973 Mar 11.3	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1973 Mar 2.2 1973 Mar 10.8	65.42 65.42	89.73 89.29	6640 6618	206 183	317 296	0.008 0.008	78 55
R													
D	Cosmos 550 rocket	1973-11B	1973 Mar 1.53 8.27 days 1973 Mar 9.80	Cylinder 2500?	7.5 long 2.6 dia	1973 Mar 2.2	65.42	89.63	6635	204	309	0.008	70
D	Cosmos 550 engine	1973-11C	1973 Mar 1.53 17 days 1973 Mar 18	Cone 600? full	1.5 long? 2 dia?	1973 Mar 13.7	65.42	89.24	6615	184	290	0.008	-
D	Fragments	1973-11D-F											

* Approximate orbit.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 551	1973-12A	1973 Mar 6.39	Sphere-cylinder	6.5 long?	1973 Mar 6.8	65.00	89.52	6629	206	296	0.007	49
R			13.8 days		2.4 dia	1973 Mar 9.5	65.00	89.40	6623	173	317	0.011	58
			1973 Mar 20.2	6300?		1973 Mar 15.3	65.01	90.18	6662	170	398	0.017	55
D	Cosmos 551 rocket	1973-12B	1973 Mar 6.39	Cylinder	7.5 long	1973 Mar 6.9	65.00	89.39	6623	203	286	0.006	50
			6.74 days	2500?	2.6 dia								
			1973 Mar 13.13										
D	Cosmos 551 engine*	1973-12D	1973 Mar 6.39	Cone	1.5 long?	1973 Mar 16.5	65.02	89.96	6651	170	376	0.015	53
			15.86 days	600? full	2 dia?								
			1973 Mar 22.25										
D	Fragments	1973-12C,E											
T	BMEWS 6	1973-13A	1973 Mar 6.5	Cylinder?	1.7 long?	1973 Apr 1.0	0.2	1435.1	42145	35679	35855	0.002	-
	[Atlas Agena D]		> million years	700 full?	1.4 dia?								
				350 empty?									
D	Agena D rocket	1973-13B	1973 Mar 6.5	Cylinder	6 long?	1973 Mar 19.7	28.27	587.96	23284	228	33584	0.717	190
			455 days	700?	1.5 dia								
			1974 Jun 4										
D	[Titan 3D]	1973-14A	1973 Mar 9.88	Cylinder	15 long	1973 Mar 10.7	95.70	88.76	6589	152	270	0.009	140
			71 days	13300? full	3.0 dia								
			1973 May 19										
D	Titan 3D rocket	1973-14B	1973 Mar 9.88	Cylinder	6 long	1973 Mar 10.7	95.68	88.27	6565	151	222	0.005	133
			1.65 days	1900	3.0 dia								
			1973 Mar 11.53										
	Meteor 14	1973-15A	1973 Mar 20.47	Cylinder + 2 vanes	5 long?	1973 Mar 20.6	81.27	102.64	7261	873	892	0.001	269
			500 years	2200?	1.5 dia?								
	Meteor 14 rocket	1973-15B	1973 Mar 20.47	Cylinder	3.8 long	1973 Mar 21.6	81.27	102.77	7267	844	933	0.006	175
			400 years	1440	2.6 dia								

* 1973-12D ejected from 1973-12A on 1973 Mar 16.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 552	1973-16A	1973 Mar 22.42 11.76 days 1973 Apr 3.18	Sphere-cylinder 5900?	5.9 long 2.4 dia	1973 Mar 22.8	72.84	89.68	6636	204	312	0.008	61
D	Cosmos 552 rocket	1973-16B	1973 Mar 22.42 8.54 days 1973 Mar 30.96	Cylinder 2500?	7.5 long 2.6 dia	1973 Mar 23.0	72.84	89.52	6628	206	294	0.007	58
D	Capsule*	1973-16C	1973 Mar 22.42 17.59 days 1973 Apr 9.01	Ellipsoid 200?	0.9 long 1.9 dia	1973 Mar 26.2	72.85	89.61	6633	199	310	0.008	51
D	Salyut 2	1973-17A	1973 Apr 3.38 55.11 days 1973 May 28.49	Cylinder + 4 wings 18500	14 long 4.15 max dia 2.0 min dia	1973 Apr 4.0 1973 Apr 5.7 1973 Apr 8.6	51.56 51.57 51.57	88.99 89.42 89.81	6606 6626 6646	207 237 257	248 259 278	0.003 0.002 0.002	59 226 81
D	Salyut 2 rocket	1973-17B	1973 Apr 3.38 3 days 1973 Apr 6	Cylinder 4000?	12 long? 4 dia	1973 Apr 3.6	51.48	88.82	6597	194	244	0.004	2
D	Fragments**	1973-17C-AB											
D	Molniya 2E	1973-18A	1973 Apr 5.47 68 months? 1978 Dec?	Windmill + 6 vanes 1250?	4.2 long? 1.6 dia?	1973 Apr 18.2 1973 Apr 18.7	65.49 65.24	702.19 717.73	26170 26555	477 532	39107 39822	0.738 0.740	285 285
D	Molniya 2E launcher rocket	1973-18B	1973 Apr 5.47 19.05 days 1973 Apr 24.52	Cylinder 2500?	7.5 long 2.6 dia	1973 Apr 6.2	65.39	91.53	6728	188	511	0.024	70
D	Molniya 2E launcher	1973-18C	1973 Apr 5.47 25.40 days 1973 Apr 30.87	Irregular	-	1973 Apr 6.0	65.40	91.25	6715	217	456	0.018	72

* 1973-16C ejected from 1973-16A about 1973 Mar 26.

** Fragments designated on 1973 Apr 4.45

1973-18 continued on page 326

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Molniya 2E rocket	1973-18D	1973 Apr 5.47 68 months? 1978 Dec?	Cylinder 440	2.0 long 2.0 dia	1973 May 2.2	65.44	699.04	26092	467	38961	0.738	284
D	Pioneer 11 second stage	1973-19C	1973 Apr 6.09 577 days 1974 Nov 4	Cylinder 1815	8.6 long 3.0 dia	1973 May 1.0	34.9	2342.0	58420	161	103922	0.888	-
D	Cosmos 553	1973-20A	1973 Apr 12.50 213.45 days 1973 Nov 11.95	Ellipsoid 400?	1.8 long 1.2 dia	1973 Apr 13.0 1973 Jul 31.9	70.96 70.96	92.22 91.38	6761 6721	272 256	494 429	0.016 0.013	80 -
D	Cosmos 553 rocket	1973-20B	1973 Apr 12.50 116.96 days 1973 Aug 7.46	Cylinder 1500?	8 long 1.65 dia	1973 Apr 13.0	70.96	92.10	6755	272	482	0.016	80
D	Cosmos 554*	1973-21A	1973 Apr 19.38 38 days 1973 May 27	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1973 Apr 19.7 1973 Apr 21.7 1973 Apr 25.8	72.85 72.85 72.85	89.50 89.58 90.04	6627 6631 6654	194 171 171	304 335 380	0.008 0.012 0.016	45 57 48
D	Cosmos 554 rocket	1973-21B	1973 Apr 19.38 7.17 days 1973 Apr 26.55	Cylinder 2500?	7.5 long 2.6 dia	1973 Apr 19.6	72.85	89.47	6626	202	293	0.007	58
D	Cosmos 554 engine**	1973-21E	1973 Apr 19.38 12 days 1973 May 1	Cone 600? full	1.5 long 2 dia?	1973 Apr 27.0	72.85	89.80	6642	169	359	0.014	43
D	Fragments	1973-21C,D,F-HE											
D	Intercosmos 9 (Copernicus 500)	1973-22A	1973 Apr 19.43 179.46 days 1973 Oct 15.89	Ellipsoid 400?	1.8 long 1.2 dia	1973 Apr 21.0 1973 Jul 16.5	48.42 48.39	102.12 97.73	7241 7030	199 192	1526 1111	0.092 0.065	108 -
D	Intercosmos 9 rocket	1973-22B	1973 Apr 19.43 181.37 days 1973 Oct 17.80	Cylinder 1500?	8 long 1.65 dia	1973 Apr 21.0 1973 Jul 16.5	48.41 48.39	102.12 97.71	7241 7029	199 194	1526 1107	0.092 0.065	108 -

Space Vehicle: Pioneer 11, 1973-19A
Burner 2 rocket, 1973-19B

* 1973-21A disintegrated about 1973 May 7.1

** 1973-21E ejected from 1973-21A on 1973 Apr 26

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Telesat 2 (Anik 2)	1973-23A	1973 Apr 20.98 > million years	Cylinder 565 full 295 empty	1.52 long 1.83 dia	1973 May 1.0 1973 Jun 1.0	0.1 0.1	1430.7 1436.2	42035 42167	35604 35786	35709 35792	0.001 0.0001	- -
D	Telesat 2 second stage	1973-23B	1973 Apr 20.98 911 days 1975 Oct 18	Cylinder + annulus 350?	6.4 long 1.52 and 2.44 dia	1973 Apr 21.9 1973 Dec 1.0	29.48 29.48	115.80 111.30	7877 7673	215 212	2783 2377	0.163 0.141	188 -
	Telesat 2 third stage	1973-23C	1973 Apr 20.98 20 years	Sphere-cone 66	1.32 long 0.94 dia	1973 Apr 21.9	29.48	645.5	24740	215	36508	0.734	188*
D R	Cosmos 555	1973-24A	1973 Apr 25.45 11.9 days 1973 May 7.3	Sphere-cylinder 5900?	5.9 long 2.4 dia	1973 Apr 25.6	81.33	89.02	6603	216	233	0.001	3
D	Cosmos 555 rocket	1973-24B	1973 Apr 25.45 3.22 days 1973 Apr 28.67	Cylinder 2500?	7.5 long 2.6 dia	1973 Apr 25.5	81.32	88.93	6598	209	231	0.002	334
D	Capsule**	1973-24D	1973 Apr 25.45 14.39 days 1973 May 9.84	Ellipsoid 200?	0.9 long 1.9 dia	1973 May 4.7	81.33	88.84	6594	209	222	0.001	327
D	Fragment	1973-24C											
D R	Cosmos 556	1973-25A	1973 May 5.29 8.9 days 1973 May 14.2	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1973 May 5.6 1973 May 6.4	81.33 81.32	88.97 89.31	6600 6617	218 210	225 267	0.0005 0.004	18 5
D	Cosmos 556 rocket	1973-25B	1973 May 5.29 3.69 days 1973 May 8.98	Cylinder 2500?	7.5 long 2.6 dia	1973 May 6.3	81.32	88.77	6590	207	216	0.0006	353

*Approximate orbit: Telesat 2 is Canadian

**1973-24D ejected from 1973-24A on 1973 May 4

1973-25 continued on page 328

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 556 engine*	1973-25C	1973 May 5.29 18.90 days 1973 May 24.19	Cone 600? full	1.5 long? 2 dia?	1973 May 13.8	81.32	89.19	6611	210	255	0.003	326
D	Fragments	1973-25D,E											
D	Cosmos 557**	1973-26A	1973 May 11.02 11.11 days 1973 May 22.13	Cylinder + 4 wings 18500	14 long 4.15 max dia 2.0 min dia	1973 May 12.2	51.59	89.01	6607	214	243	0.002	83
D	Cosmos 557 rocket	1973-26B	1973 May 11.02 6.01 days 1973 May 17.03	Cylinder 4000?	12 long? 4 dia	1973 May 12.2	51.60	88.79	6596	209	226	0.001	57
T	Skylab 1 [Saturn 513]	1973-27A	1973 May 14.73 6½ years†	Cylinders + 4 vanes 74783	25.64 long 6.6 dia 27.4 span	1973 May 16.5	50.04	93.18	6811	427	439	0.0009	285
D	Skylab 1 rocket	1973-27B	1973 May 14.73 606.60 days 1975 Jan 11.33	Cylinder 56100?	24.8 long 10.0 dia	1973 May 15.0 1974 Feb 1.0	50.05 50.05	92.51 91.99	6779 6755	363 347	439 407	0.006 0.004	249 -
D	Fragments	1973-27C-Z											
D	[Titan 3B Agena D]	1973-28A	1973 May 16.69 28 days 1973 Jun 13	Cylinder 3000?	8 long? 1.5 dia	1973 May 16.8 1973 May 17.7	110.49 110.51	89.39 89.89	6622 6647	136 139	352 399	0.016 0.020	143 141
D	Cosmos 558	1973-29A	1973 May 17.56 219.33 days 1973 Dec 22.89	Ellipsoid 400?	1.8 long 1.2 dia	1973 May 17.8 1973 Sep 1.0	70.98 70.98	92.26 91.54	6763 6729	269 256	501 445	0.017 0.014	86 -
D	Cosmos 558 rocket	1973-29B	1973 May 17.56 116.33 days 1973 Sep 10.89	Cylinder 1500?	8 long 1.65 dia	1973 May 17.8	70.98	92.15	6758	268	491	0.016	89

* 1973-25C ejected from 1973-25A on 1973 May 13

** Cosmos 557 was probably an intended Salyut.

†Subject to orbital manoeuvres

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 559*	1973-30A	1973 May 18.46	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1973 May 18.6	65.41	89.79	6643	204	325	0.009	68
R			4.8 days										
			1973 May 23.3										
D	Cosmos 559 rocket	1973-30B	1973 May 18.46	Cylinder 2500?	7.5 long 2.6 dia	1973 May 18.9	65.41	89.74	6640	205	319	0.009	75
			10 days										
			1973 May 28										
D	Cosmos 559 engine**	1973-30D	1973 May 18.46	Cone 600? full	1.5 long? 2 dia?	1973 May 22.8	65.39	89.78	6642	211	317	0.008	84
			24.87 days										
			1973 Jun 12.33										
D	Fragment	1973-30C											
D	Cosmos 560	1973-31A	1973 May 23.44	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1973 May 24.1	72.85	89.68	6637	203	314	0.008	68
R			12.8 days			1973 May 25.3	72.84	89.41	6623	181	309	0.010	60
			1973 Jun 5.2										
D	Cosmos 560 rocket	1973-31B	1973 May 23.44	Cylinder 2500?	7.5 long 2.6 dia	1973 May 24.1	72.84	89.54	6630	201	302	0.008	52
			8.85 days										
			1973 Jun 1.29										
D	Cosmos 560 engine	1973-31D	1973 May 23.44	Cone 600? full	1.5 long? 2 dia?	1973 Jun 5.7	72.85	89.23	6614	175	297	0.009	29
			20.17 days										
			1973 Jun 12.61										
D	Fragments	1973-31C,E											
O	Skylab 2†	1973-32A	1973 May 25.54	Cone-cylinder 13780	10.36 long 3.91 dia	1973 May 25.5	50.04	89.59	6636	156	359	0.015	-
3M	[Saturn 206]		28.04 days			1973 May 25.7	50.04	91.81	6744	359	373	0.001	-
R			1973 Jun 22.58			1973 May 31.9	50.03	93.17	6811	425	440	0.001	325
D	Skylab 2 rocket	1973-32B	1973 May 25.54	Cylinder 13600?	18.7 long 6.6 dia	1973 May 25.5	50.04	89.52	6632	156	352	0.015	-
			< ½ day										
			1973 May 25										

* Manoeuvrable.

** 1973-30D ejected from 1973-30A on 1973 May 22.

†Skylab 2 rendezvous with Skylab 1 on 1973 May 25.86; docked 1973 May 26.16; undocked 1973 Jun 22.37

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 561	1973-33A	1973 May 25.57 11.67 days 1973 Jun 6.24	Sphere-cylinder 5900?	5.9 long 2.4 dia	1973 May 26.6	65.41	89.51	6629	206	295	0.007	68
D	Cosmos 561 rocket	1973-33B	1973 May 25.57 7.72 days 1973 Jun 2.29	Cylinder 2500?	7.5 long 2.6 dia	1973 May 26.7	65.40	89.34	6620	200	284	0.006	59
D	Capsule*	1973-33D	1973 May 25.57 25.61 days 1973 Jun 20.18	Ellipsoid 200?	0.9 long 1.9 dia	1973 Jun 3.9	65.39	89.39	6623	206	283	0.006	69
D	Fragment	1973-33C											
	Meteor 15	1973-34A	1973 May 29.43 500 years	Cylinder + 2 vanes, 2200?	5 long? 1.5 dia?	1973 May 30.8	81.22	102.48	7253	853	896	0.003	284
	Meteor 15 rocket	1973-34B	1973 May 29.43 400 years	Cylinder 1440	3.8 long 2.6 dia	1973 May 31.5	81.23	102.72	7264	852	920	0.005	178
D	Cosmos 562	1973-35A	1973 Jun 5.48 215.91 days 1974 Jan 7.39	Ellipsoid 400?	1.8 long 1.2 dia	1973 Jun 5.7 1973 Sep 16.0	70.98 70.98	92.13 91.46	6757 6725	270 259	487 434	0.016 0.013	85 -
D	Cosmos 562 rocket	1973-35B	1973 Jun 5.48 116.23 days 1973 Sep 29.71	Cylinder 1500?	8 long 1.65 dia	1973 Jun 5.6	70.99	92.04	6752	264	484	0.016	80
D R	Cosmos 563	1973-36A	1973 Jun 6.48 11.72 days 1973 Jun 18.20	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1973 Jun 7.0 1973 Jun 8.6	65.40 65.40	89.53 89.17	6630 6612	206 177	298 291	0.007 0.009	64 64
D	Cosmos 563 rocket	1973-36B	1973 Jun 6.48 7 days 1973 Jun 13	Cylinder 2500?	7.5 long 2.6 dia	1973 Jun 7.0	65.40	89.40	6624	200	292	0.007	57

*1973-33D ejected from 1973-33A on 1973 Jun 3

1973-36 continued on page 331

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 563 engine*	1973-36D	1973 Jun 6.48 19 days 1973 Jun 25	Cone 600? full	1.5 long? 2 dia?	1973 Jun 20.8	65.40	89.00	6604	173	278	0.008	-
D	Fragments	1973-36C, E											
	Cosmos 564	1973-37A	1973 Jun 8.65 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Jun 9.9	74.03	114.68	7818	1395	1484	0.006	112
	Cosmos 565	1973-37B	1973 Jun 8.65 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Jun 10.2	74.01	115.36	7849	1450	1492	0.003	155
	Cosmos 566	1973-37C	1973 Jun 8.65 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Jun 11.0	74.01	115.12	7838	1435	1485	0.003	126
	Cosmos 567	1973-37D	1973 Jun 8.65 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Jun 11.0	74.01	114.88	7828	1414	1486	0.005	122
	Cosmos 568	1973-37E	1973 Jun 8.65 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Jun 10.6	74.02	114.43	7808	1378	1482	0.007	107
	Cosmos 569	1973-37F	1973 Jun 8.65 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Jun 10.2	74.02	114.23	7799	1359	1482	0.008	106
	Cosmos 570	1973-37G	1973 Jun 8.65 6000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Jun 10.2	74.02	114.03	7789	1341	1481	0.009	105
	Cosmos 571	1973-37H	1973 Jun 8.65 6000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Jun 10.9	74.03	113.81	7779	1321	1481	0.010	98
	Cosmos 564 rocket	1973-37J	1973 Jun 8.65 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1973 Jun 10.9	74.02	116.95	7921	1479	1606	0.008	254

* 1973-36D ejected from 1973-36A on 1973 Jun 17

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 572	1973-38A	1973 Jun 10.43	Sphere-cylinder	6.5 long?	1973 Jun 10.6	51.66	89.32	6622	206	281	0.006	57
R			12.86 days	6300?	2.4 dia	1973 Jun 15.0	51.64	88.89	6601	174	271	0.007	68
			1973 Jun 23.29										
D	Cosmos 572 rocket	1973-38B	1973 Jun 10.43	Cylinder	7.5 long	1973 Jun 10.6	51.64	89.22	6617	199	280	0.006	39
			5.90 days	2500?	2.6 dia								
			1973 Jun 16.33										
D	Cosmos 572 engine*	1973-38C	1973 Jun 10.43	Cone	1.5 long?	1973 Jun 23.0	51.65	88.95	6604	171	280	0.008	91
			16 days	600? full	2 dia?								
			1973 Jun 26										
D	Fragment	1973-38D											
D	Explorer 49 third stage	1973-39B	1973 Jun 10.59	Sphere-cone	1.32 long	1973 Jun 10.6	29.11	15013	201591	182	390244	0.967	118**
			5 years?	66	0.94 dia								
			1978?										
C	Explorer 49 second stage	1973-39C	1973 Jun 10.59	Cylinder	5.2 long	1973 Jun 11.7	29.34	107.80	7506	182	2074	0.126	125
			233.10 days	600?	2.44 dia	1973 Oct 1.0	29.34	102.30	7249	177	1565	0.096	-
			1974 Jan 29.69										
2d	Fragments	1973-39D,E,H											
T	IMEWS 4 [Titan 3C]	1973-40A	1973 June 12.4?	Cylinder + 4 panels	6 long?	1973 Jun 12.7	26.33	633.0	24446	297	35839	0.727	180**
			> million years	820?	2.5 dia?	1973 Jul 1.0	0.3	1435.9	42160	35777	35786	0.0001	-
	Transtage	1973-40B	1973 Jun 12.4?	Cylinder	6 long?	1973 Jul 1.0	0.3	1435.9	42160	35777	35786	0.0001	-
			> million years	1500?	3 dia								

* 1973-38C ejected from 1973-38A on 1973 Jun 22

Space Vehicle: Explorer 49 (RAE 2), 1973-39A;
Explorer 49 retrorocket, 1973-39F;
Fragment, 1973-39G.

** Approximate orbits

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi-major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 573	1973-41A	1973 Jun 15.25 2.0 days 1973 Jun 17.3	Sphere-cylinder 6570?	7.5 long 2.2 dia	1973 Jun 16.3	51.58	89.46	6629	192	309	0.009	77
D	Cosmos 573 rocket	1973-41B	1973 Jun 15.25 5.95 days 1973 Jun 21.20	Cylinder 2500?	7.5 long 2.6 dia	1973 Jun 16.3	51.60	89.26	6619	189	292	0.008	77
D	Fragment	1973-41C											
	Cosmos 574	1973-42A	1973 Jun 20.26 1400 years	Cylinder? 700?	1.3 long? 1.9 dia?	1973 Jun 23.2	82.94	105.14	7378	985	1014	0.002	281
	Cosmos 574 rocket	1973-42B	1973 Jun 20.26 750 years	Cylinder 2200?	7.4 long 2.4 dia	1973 Jun 22.2	82.95	105.03	7373	984	1005	0.001	261
D R	Cosmos 575	1973-43A	1973 Jun 21.56 11.71 days 1973 Jul 3.27	Sphere-cylinder 5700?	5.0 long 2.4 dia	1973 Jun 23.0	65.41	89.25	6616	204	271	0.005	50
D	Cosmos 575 rocket	1973-43B	1973 Jun 21.56 5.68 days 1973 Jun 27.24	Cylinder 2500?	7.5 long 2.6 dia	1973 Jun 22.5	65.39	89.10	6609	196	265	0.005	34
D R	Cosmos 576	1973-44A	1973 Jun 27.50 11.79 days 1973 Jul 9.29	Sphere-cylinder 5900?	5.9 long 2.4 dia	1973 Jun 28.6	72.86	89.88	6646	204	332	0.010	63
D	Cosmos 576 rocket	1973-44B	1973 Jun 27.50 9.81 days 1973 Jul 7.31	Cylinder 2500?	7.5 long 2.6 dia	1973 Jun 28.7	72.85	89.66	6635	199	315	0.009	52

1973-44 continued on page 334

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Capsule*	1973-44H	1973 Jun 27.50 17 days 1973 Jul 14	Ellipsoid 200?	0.9 long 1.9 dia	1973 Jul 10.1	72.90	91.42	6723	212	478	0.020	359
D	Fragments	1973-44C-G											
D	Molniya 2F	1973-45A	1973 Jul 11.42 1822 days? 1978 Jul 7?	Windmill + 6 vanes 1250?	4.2 long? 1.6 dia?	1973 Jul 27.1 1973 Sep 1.0	65.41 65.58	705.06 717.81	26241 26557	441 422	39285 39936	0.740 0.744	285 -
D	Molniya 2F launcher	1973-45B	1973 Jul 11.42 41.74 days 1973 Aug 22.16	Irregular	-	1973 Jul 11.7	65.41	91.36	6720	221	463	0.018	67
D	Molniya 2F launcher rocket	1973-45C	1973 Jul 11.42 23.00 days 1973 Aug 3.42	Cylinder 2500?	7.5 long 2.6 dia	1973 Jul 12.4	65.42	91.34	6719	197	484	0.021	67
D	Molniya 2F rocket	1973-45D	1973 Jul 11.42 1851 days 1978 Aug 5	Cylinder 440	2.0 long 2.0 dia	1973 Jul 22.7	65.40	702.58	26179	439	39163	0.740	285
D	[Titan 3D]	1973-46A	1973 Jul 13.85 91 days 1973 Oct 12	Cylinder 13300? full	15 long 3.0 dia	1973 Jul 15.7	96.21	88.77	6591	156	269	0.009	145
D	Titan 3D rocket	1973-46B	1973 Jul 13.85 1.97 days 1973 Jul 15.82	Cylinder 1900	6 long 3.0 dia	1973 Jul 15.1	96.21	88.11	6558	145	215	0.005	143

* 1973-44H ejected from 1973-44A on 1973 Jul 9

Year of launch 1973 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Mars 4 launcher rocket	1973-47B	1973 Jul 21.81 1.45 days 1973 Jul 23.26	Cylinder 4000?	12 long? 4 dia	1973 Jul 22.5	51.52	87.94	6553	156	194	0.003	315
D	Mars 4 launcher	1973-47C	1973 Jul 21.81 5 days 1973 Jul 26	Irregular	-	1973 Jul 22.8	51.52	87.70	6541	147	179	0.002	321
D	Cosmos 577	1973-48A	1973 Jul 25.48 12.71 days 1973 Aug 7.19	Sphere- cylinder 6300?	6.5 long? 2.4 dia	1973 Jul 25.7 1973 Jul 28.6	65.39 65.40	89.45 89.33	6626 6620	207 171	289 313	0.006 0.011	56 54
R													
D	Cosmos 577 rocket	1973-48B	1973 Jul 25.48 6.59 days 1973 Aug 1.07	Cylinder 2500?	7.5 long 2.6 dia	1973 Jul 27.3	65.39	89.17	6612	192	276	0.006	40
D	Cosmos 577 engine*	1973-48D	1973 Jul 25.48 18 days 1973 Aug 12	Cone 600? full	1.5 long? 2 dia?	1973 Aug 6.8	65.41	89.03	6605	172	282	0.008	50
D	Fragments	1973-48C, E											
D	Mars 5 launcher rocket	1973-49B	1973 Jul 25.79 1.47 days 1973 Jul 27.26	Cylinder 4000?	12 long? 4 dia	1973 Jul 26.6	51.55	87.86	6549	153	189	0.003	326
D	Mars 5 launcher	1973-49C	1973 Jul 25.79 2 days 1973 Jul 27	Irregular -	-	1973 Jul 26.5	51.55	87.77	6545	159	174	0.001	-
D	Skylab 3**	1973-50A	1973 Jul 28.47	Cone-cylinder	10.36 long;	1973 Jul 28.5	50.03	88.33	6573	159	230	0.005	-
3M	[Saturn 207]		59.46 days	13860	3.91 dia	1973 Jul 28.9	50.03	93.15	6810	425	438	0.001	-
R			1973 Sep 25.93										
D	Skylab 3 rocket	1973-50B	1973 Jul 28.47 0.24 day 1973 Jul 28.71	Cylinder 13600?	18.7 long 6.6 dia	1973 Jul 28.5	50.03	88.26	6569	159	223	0.005	56

* 1973-48D was ejected from 1973-48A on 1973 Aug 6

Space Vehicles: Mars 4, 1973-47A; and Mars 5, 1973-49A

** Skylab 3 docked with Skylab 1 on 1973 Jul 28.82

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D R	Cosmos 578	1973-51A	1973 Aug 1.59 11.7 days 1973 Aug 13.3	Sphere-cylinder 5700?	5.0 long 2.4 dia	1973 Aug 2.2	65.38	89.41	6624	200	292	0.007	47
D	Cosmos 578 rocket	1973-51B	1973 Aug 1.59 7.72 days 1973 Aug 9.31	Cylinder 2500?	7.5 long 2.6 dia	1973 Aug 2.4	65.38	89.27	6617	200	278	0.006	48
D	Fragments	1973-51C-E											
D	Mars 6 launcher rocket	1973-52B	1973 Aug 5.74 1.52 days 1973 Aug 7.26	Cylinder 4000?	12 long? 4 dia	1973 Aug 6.5	51.54	87.92	6552	155	193	0.003	320
D	Mars 6 launcher	1973-52C	1973 Aug 5.74 2 days 1973 Aug 7	Irregular -	-	1973 Aug 6.5	51.5	87.91	6552	154	193	0.003	-
D	Mars 7 launcher rocket	1973-53B	1973 Aug 9.71 1.46 days 1973 Aug 11.17	Cylinder 4000?	12 long? 4 dia	1973 Aug 10.4	51.51	87.91	6552	154	193	0.003	328
D	Mars 7 launcher	1973-53C	1973 Aug 9.71 2 days 1973 Aug 11	Irregular -	-	Orbit similar to 1973-53B							
T	[Thor Burner 2]*	1973-54A	1973 Aug 17.20 80 years	12-faced frustum 195	1.64 long 1.31 to 1.10 dia	1973 Aug 17.5	98.86	101.58	7210	811	852	0.003	242
	Burner 2 rocket	1973-54B	1973 Aug 17.20 60 years	Sphere-cone 66	1.32 long 0.94 dia	1973 Aug 18.4	98.84	101.54	7208	808	851	0.003	245

Space Vehicles: Mars 6, 1973-52A; and Mars 7, 1973-53A. * DMSP

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 579	1973-55A	1973 Aug 21.52	Sphere-cylinder	6.5 long?	1973 Aug 22.6	65.41	89.27	6617	196	282	0.007	58
R			12.7 days	6300?	2.4 dia	1973 Aug 24.7	65.42	89.38	6623	175	314	0.010	53
			1973 Sep 3.2										
D	Cosmos 579 rocket	1973-55B	1973 Aug 21.52	Cylinder	7.5 long	1973 Aug 23.2	65.41	89.22	6615	194	279	0.006	45
			6.64 days	2500?	2.6 dia								
			1973 Aug 28.16										
D	Cosmos 579 engine*	1973-55D	1973 Aug 21.52	Cone	1.5 long?	1973 Sep 3.0	65.43	88.65	6586	169	247	0.006	49
			14.86 days	600? full	2 dia?								
			1973 Sep 5.38										
D	Fragments	1973-55C,E											
	SDS-B [Titan 3B Agena D]	1973-56A	1973 Aug 21.67	Cylinder?	-	1973 Sep 1.0	63.29	705.68	26256	460	39296	0.740	269
			10 years?										
	Agena D rocket	1973-56B	1973 Aug 21.67	Cylinder	6 long?	1973 Sep 1.4	63.27	699.80	26111	360	39105	0.742	269
			10 years?	700?	1.5 dia	1975 Jan 1.0	63.21	697.4	26051	808	38538	0.724	-
B	Cosmos 580	1973-57A	1973 Aug 22.48	Ellipsoid	1.8 long	1973 Aug 23.9	71.00	92.22	6761	273	493	0.016	76
			221.70 days	400?	1.2 dia	1973 Dec 16.5	70.99	91.23	6714	256	415	0.012	-
			1974 Apr 1.18										
D	Cosmos 580 rocket	1973-57B	1973 Aug 22.48	Cylinder	8 long	1973 Aug 23.6	71.00	92.08	6754	273	479	0.015	75
			100.48 days	1500?	1.65 dia								
			1973 Nov 30.96										
T	Intelsat 4E (F-7)	1973-58A	1973 Aug 23.96	Cylinder	2.82 long	1973 Aug 24.0	27.38	657.0	25026	570	36726	0.722	180
			> million years	1410 full	2.39 dia	1973 Aug 25.5	0.4	1432.7	42111	35539	35927	0.005	-
				720 empty		1973 Oct 1.0	0.3	1436.3	42169	35784	35797	0.0002	-
	Intelsat 4E rocket	1973-58B	1973 Aug 23.96	Cylinder	8.6 long	1973 Aug 28.7	27.50	655.2	24983	597	36612	0.721	182
			6000 years	1815	3.0 dia								

* 1973-55D was ejected from 1973-55A on 1973 Sep 2.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 581	1973-59A	1973 Aug 24.47	Sphere-cylinder	6.5 long?	1973 Aug 25.3	51.62	89.40	6626	208	288	0.006	44
R			12.8 days	6300?	2.4 dia	1973 Aug 26.6	51.61	89.00	6606	172	284	0.008	62
			1973 Sep 6.3										
D	Cosmos 581 rocket	1973-59B	1973 Aug 24.47	Cylinder	7.5 long	1973 Aug 25.6	51.62	89.15	6614	202	269	0.005	34
			6.66 days	2500?	2.6 dia								
			1973 Aug 31.13										
D	Cosmos 581 engine*	1973-59E	1973 Aug 24.47	Cone	1.5 long?	1973 Sep 5.6	51.62	88.86	6599	176	266	0.007	103
			15.78 days	600? full	2 dia?								
			1973 Sep 9.25										
D	Fragments	1973-59C,D											
	Cosmos 582	1973-60A	1973 Aug 28.42	Cylinder +	2 long?	1973 Aug 31.3	74.04	95.27	6909	519	543	0.002	359
			8 years	paddles? 900?	1 dia?								
	Cosmos 582 rocket	1973-60B	1973 Aug 28.42	Cylinder	7.4 long	1973 Sep 1.0	74.04	95.19	6905	510	544	0.003	14
			7 years	2200?	2.4 dia								
2d	Fragments	1973-60C-E											
	Molniya 1Z	1973-61A	1973 Aug 30.01	Windmill +	3.4 long	1973 Sep 6.2	65.47	717.77	26556	463	39893	0.742	284
			5¾ years	6 vanes	1.6 dia								
				1000?									
D	Molniya 1Z launcher rocket	1973-61B	1973 Aug 30.01	Cylinder	7.5 long	1973 Aug 31.0	65.43	91.30	6717	219	458	0.018	65
			32.77 days	2500?	2.6 dia								
			1973 Oct 1.78										
D	Molniya 1Z launcher	1973-61C	1973 Aug 30.01	Irregular	-	1973 Aug 30.9	65.40	91.57	6730	223	481	0.019	69
			39.48 days										
			1973 Oct 8.49										

* 1973-59E ejected from 1973-59A on 1973 Sep 5.

1973-61 continued on page 339

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Molniya 1Z rocket	1973-61F	1973 Aug 30.01 5.6 years	Cylinder 440	2.0 long 2.0 dia	1973 Oct 1.0	65.3	678.2	25572	435	37953	0.733	-
D	Fragments	1973-61D,E											
D	Cosmos 583	1973-62A	1973 Aug 30.44	Sphere-cylinder	5.0 long	1973 Aug 31.6	64.92	89.52	6629	204	298	0.007	46
R			12.9 days 1973 Sep 12.3	5700?	2.4 dia								
D	Cosmos 583 rocket	1973-62B	1973 Aug 30.44 6.74 days 1973 Sep 6.18	Cylinder 2500?	7.5 long 2.6 dia	1973 Aug 31.2	64.92	89.35	6621	200	285	0.006	37
D	Fragment	1973-62C											
D	Cosmos 584	1973-63A	1973 Sep 6.45	Sphere-cylinder	6.5 long?	1973 Sep 7.5	72.85	89.95	6649	205	336	0.010	63
R			13.74 days 1973 Sep 20.19	6300?	2.4 dia	1973 Sep 11.0 1973 Sep 15.4	72.84 72.85	89.21 89.70	6613 6637	204 204	265 314	0.005 0.008	65 60
D	Cosmos 584 rocket	1973-63B	1973 Sep 6.45 10.70 days 1973 Sep 17.15	Cylinder 2500?	7.5 long 2.6 dia	1973 Sep 7.2	72.85	89.83	6643	202	327	0.009	60
D	Cosmos 584 engine*	1973-63E	1973 Sep 6.45 22.44 days 1973 Sep 28.89	Cone 600? full	1.5 long? 2 dia?	1973 Sep 19.5	72.85	89.60	6632	203	305	0.008	47
D	Fragments	1973-63C,D,F,G											
	Cosmos 585	1973-64A	1973 Sep 8.07 6000 years	- 500?	-	1973 Sep 8.4	73.99	113.63	7770	1368	1416	0.003	237
	Cosmos 585 rocket	1973-64B	1973 Sep 8.07 4000 years	Cylinder 2200?	7.4 long 2.4 dia	1973 Sep 8.7	73.97	113.49	7763	1375	1395	0.001	218
	Fragment	1973-64C											

*1973-63E ejected from 1973-63A on 1973 Sep 19

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 586	1973-65A	1973 Sep 14.02 1200 years	Cylinder? 700?	1.3 long? 1.9 dia?	1973 Sep 16.9	82.94	104.89	7368	971	1009	0.003	267
	Cosmos 586 rocket	1973-65B	1973 Sep 14.02 600 years	Cylinder 2200?	7.4 long 2.4 dia	1973 Sep 16.1	82.95	104.75	7361	969	997	0.002	260
D	Cosmos 587	1973-66A	1973 Sep 21.55	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1973 Sep 22.5	65.42	89.55	6631	205	300	0.007	66
R			12.8 days 1973 Oct 4.3			1973 Sep 26.6	65.44	89.18	6612	174	294	0.009	57
D	Cosmos 587 rocket	1973-66B	1973 Sep 21.55 6.49 days 1973 Sep 28.04	Cylinder 2500?	7.5 long 2.6 dia	1973 Sep 22.2	65.41	89.41	6624	201	290	0.007	60
D	Cosmos 587 engine*	1973-66D	1973 Sep 21.55 17 days 1973 Oct 8	Cone 600? full	1.5 long? 2 dia?	1973 Oct 3.3	65.42	89.40	6623	170	320	0.011	50
D	Fragments	1973-66C,E											
D	Soyuz 12	1973-67A	1973 Sep 27.51	Sphere-cylinder 6570?	7.5 long 2.2 dia	1973 Sep 27.6	51.58	88.54	6583	181	229	0.004	10
2M			1.97 days			1973 Sep 27.8	51.58	91.20	6713	326	344	0.001	301
R			1973 Sep 29.48										
D	Soyuz 12 rocket	1973-67B	1973 Sep 27.51 2.02 days 1973 Sep 29.53	Cylinder 2500?	7.5 long 2.6 dia	1973 Sep 27.8	51.58	88.49	6581	186	219	0.003	70
D	Soyuz 12 orbital module	1973-67C	1973 Sep 27.51 116 days 1974 Jan 21	Spheroid 1200?	2.5 long 2.2 dia	1973 Oct 1.0	51.58	91.07	6707	311	346	0.003	-
D	Fragment	1973-67D											

*1973-66D ejected from 1973-66A on 1973 Oct 3

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	[Titan 3B Agena D]	1973-68A	1973 Sep 27.72 32 days 1973 Oct 29	Cylinder 3000?	8 long? 1.5 dia	1973 Sep 28.3	110.48	89.67	6636	131	385	0.019	146
	Cosmos 588	1973-69A	1973 Oct 2.91 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Oct 3.0	74.00	115.37	7851	1451	1494	0.003	150
	Cosmos 589	1973-69B	1973 Oct 2.91 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Oct 3.0	74.01	114.95	7831	1419	1487	0.004	123
	Cosmos 590	1973-69C	1973 Oct 2.91 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Oct 3.0	74.00	115.15	7840	1438	1486	0.003	125
	Cosmos 591	1973-69D	1973 Oct 2.91 6000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Oct 3.0	74.00	114.20	7797	1349	1488	0.009	108
	Cosmos 592	1973-69E	1973 Oct 2.91 6000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Oct 3.0	74.00	114.01	7788	1333	1486	0.010	102
	Cosmos 593	1973-69F	1973 Oct 2.91 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Oct 3.0	74.00	114.39	7805	1366	1487	0.008	108
	Cosmos 594	1973-69G	1973 Oct 2.91 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Oct 3.0	74.01	114.57	7813	1382	1488	0.007	110
	Cosmos 595	1973-69H	1973 Oct 2.91 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Oct 3.0	74.00	114.77	7822	1402	1486	0.005	111
	Cosmos 588 rocket	1973-69J	1973 Oct 2.91 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1973 Oct 3.0	74.01	117.19	7933	1485	1625	0.009	260

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 596	1973-70A	1973 Oct 3.54	Sphere-	5.9 long?	1973 Oct 3.8	65.41	89.42	6625	206	287	0.006	66
R			5.78 days	cylinder	2.4 dia								
			1973 Oct 9.32	5900?									
D	Cosmos 596 rocket	1973-70B	1973 Oct 3.54	Cylinder	7.5 long	1973 Oct 4.3	65.41	89.24	6616	200	275	0.006	51
			5.85 days	2500?	2.6 dia								
			1973 Oct 9.39										
D	Capsule* ?	1973-70C	1973 Oct 3.54	Ellipsoid?	0.9 long?	1973 Oct 9.4	65.40	89.25	6616	203	273	0.005	61
			13.93 days	200?	1.9 dia?								
			1973 Oct 17.47										
D	Cosmos 597	1973-71A	1973 Oct 6.52	Sphere-	6.5 long?	1973 Oct 6.8	65.42	89.45	6626	206	290	0.006	64
R			5.8 days	cylinder	2.4 dia	1973 Oct 8.6	65.42	89.07	6607	207	251	0.003	79
			1973 Oct 12.3	6300?									
D	Cosmos 597 rocket	1973-71B	1973 Oct 6.52	Cylinder	7.5 long	1973 Oct 6.9	65.40	89.35	6621	206	280	0.006	59
			8.07 days	2500?	2.6 dia								
			1973 Oct 14.59										
D	Cosmos 597 engine**	1973-71E	1973 Oct 6.52	Cone	1.5 long?	1973 Oct 11.7	65.45	88.75	6591	200	226	0.002	83
			12 days	600? full	2 dia?								
			1973 Oct 18										
D	Fragments	1973-71C,D											
D	Cosmos 598	1973-72A	1973 Oct 10.45	Sphere-	6.5 long?	1973 Oct 10.8	72.84	89.94	6649	208	334	0.010	66
R			5.8 days	cylinder	2.4 dia	1973 Oct 14.0	72.84	89.02	6604	204	247	0.003	72
			1973 Oct 16.3	6300?									
D	Cosmos 598 rocket	1973-72B	1973 Oct 10.45	Cylinder	7.5 long	1973 Oct 11.1	72.84	89.82	6643	203	327	0.009	60
			10.58 days	2500?	2.6 dia								
			1973 Oct 21.03										

* 1973-70C ejected from 1973-70A on 1973 Oct 9

** 1973-71E ejected from 1973-71A on 1973 Oct 11

1973-72 continued on page 343

Year of launch 1973 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 598 engine*	1973-72D	1973 Oct 10.45 10 days 1973 Oct 20	Cone 600? full	1.5 long? 2 dia?	1973 Oct 15.8	72.85	88.92	6599	199	242	0.003	67
D	Fragments	1973-72C,E											
D	Cosmos 599	1973-73A	1973 Oct 15.37	Sphere-	5.0 long	1973 Oct 15.5	64.94	89.32	6619	202	280	0.006	38
R			12.9 days 1973 Oct 28.3	cylinder 5700?	2.4 dia								
D	Cosmos 599 rocket	1973-73B	1973 Oct 15.37 5.73 days 1973 Oct 21.10	Cylinder 2500?	7.5 long 2.6 dia	1973 Oct 16.3	64.94	89.18	6612	200	268	0.005	35
D	Fragments	1973-73C,D											
D	Cosmos 600	1973-74A	1973 Oct 16.51	Sphere-	6.5 long?	1973 Oct 17.1	72.83	89.97	6651	205	340	0.010	71
R			6.8 days 1973 Oct 23.3	cylinder 6300?	2.4 dia	1973 Oct 18.7	72.82	88.90	6597	201	237	0.003	105
D	Cosmos 600 rocket	1973-74B	1973 Oct 16.51 11.64 days 1973 Oct 28.15	Cylinder 2500?	7.5 long 2.6 dia	1973 Oct 17.0	72.83	89.90	6647	205	333	0.010	73
D	Cosmos 600 engine**	1973-74E	1973 Oct 16.51 13 days 1973 Oct 29	Cone 600? full	1.5 long? 2 dia?	1973 Oct 26.4	72.85	90.62	6683	256	354	0.007	355
D	Fragments	1973-74C,D											

* 1973-72D ejected from 1973-72A on 1973 Oct 15

** 1973-74E ejected from 1973-74A on 1973 Oct 22

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 601	1973-75A	1973 Oct 16.59 303 days 1974 Aug 15	Ellipsoid 400?	1.8 long 1.2 dia	1973 Oct 18.5 1974 Mar 1.0	81.91 81.91	102.28 98.43	7244 7060	200 194	1531 1169	0.092 0.069	68 -
D	Cosmos 601 rocket	1973-75C	1973 Oct 16.59 162.98 days 1974 Mar 28.57	Cylinder 1500?	8 long 1.65 dia	1973 Oct 22.5 1974 Jan 1.0	81.92 81.92	102.05 98.30	7232 7053	210 204	1497 1146	0.089 0.067	58 -
D	Fragments	1973-75B,D-P											
	Molniya 2G	1973-76A	1973 Oct 19.44 9 years	Windmill + 6 vanes 1250?	4.2 long? 1.6 dia?	1973 Oct 25.6	62.84	717.93	26560	509	39855	0.741	289
D	Molniya 2G launcher rocket	1973-76B	1973 Oct 19.44 45.53 days 1973 Dec 3.97	Cylinder 2500?	7.5 long 2.6 dia	1973 Oct 21.6	62.81	91.94	6748	216	524	0.023	123
D	Molniya 2G launcher	1973-76C	1973 Oct 19.44 60.23 days 1973 Dec 18.67	Irregular	-	1973 Oct 21.6	62.82	92.62	6782	209	599	0.029	122
	Molniya 2G rocket	1973-76D	1973 Oct 19.44 9 years	Cylinder 440	2.0 long 2.0 dia	1973 Oct 29.2	62.87	733.19	26935	597	40517	0.741	288
D	Cosmos 602	1973-77A	1973 Oct 20.43 8.8 days 1973 Oct 29.2	Sphere- cylinder 6300?	6.5 long? 2.4 dia	1973 Oct 20.7 1973 Oct 23.0	72.88 72.86	89.97 89.31	6651 6618	210 170	335 309	0.009 0.011	70 40
R													
D	Cosmos 602 rocket	1973-77B	1973 Oct 20.43 10.90 days 1973 Oct 31.33	Cylinder 2500?	7.5 long 2.6 dia	1973 Oct 21.1	72.85	89.84	6644	201	331	0.010	60
D	Cosmos 602 engine*	1973-77D	1973 Oct 20.43 12 days 1973 Nov 1	Cone 600? full	1.5 long? 2 dia?	1973 Oct 28.7	72.87	88.71	6588	169	250	0.006	25
D	Fragment	1973-77C											

*1973-77D ejected from 1973-77A on 1973 Oct 28

Year of launch 1973 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Explorer 50 (Imp 10)	1973-78A	1973 Oct 26.10 > million years	16-sided cylinder 371 full	1.58 long 1.35 dia	1973 Oct 26.1 1973 Oct 29.3	28.77 28.67	6971.0 17279	120881 221399	197 141185	228809 288857	0.946 0.333	120 52
D	Explorer 50 first stage	1973-78B	1973 Oct 26.10 3 days 1973 Oct 29	Cylinder 2750?	21.64 long 2.44 dia	1973 Oct 26.5	28.74	90.98	6708	147	513	0.027	76
	Explorer 50 second stage	1973-78C	1973 Oct 26.10 25 years	Cylinder 350?	4.9 long 1.43 dia	1973 Oct 27.2	28.85	112.30	7720	363	2321	0.127	172
D	Explorer 50 third stage	1973-78D	1973 Oct 26.10 3.4 years? 1977 Mar ?	Sphere - cone 66	1.32 long 0.94 dia	1973 Oct 26.1	28.77	6971.0	120881	197	228809	0.946	120
D	Fragment	1973-78E											
D	Cosmos 603	1973-79A	1973 Oct 27.47 12.8 days 1973 Nov 9.3	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1973 Oct 28.5 1973 Nov 5.4	72.86 72.84	90.15 89.12	6659 6608	205 172	357 288	0.011 0.009	67 41
R													
D	Cosmos 603 rocket	1973-79B	1973 Oct 27.47 12.53 days 1973 Nov 9.00	Cylinder 2500?	7.5 long 2.6 dia	1973 Oct 28.7	72.84	90.00	6652	202	345	0.011	63
D	Cosmos 603 engine*	1973-79F	1973 Oct 27.47 17.26 days 1973 Nov 13.73	Cone 600? full	1.5 long? 2 dia?	1973 Nov 10.3	72.84	88.77	6591	169	257	0.007	32
D	Fragments	1973-79C-E											
	Cosmos 604	1973-80A	1973 Oct 29.59 60 years	Cylinder + 2 vanes ? 2500?	5 long? 1.5 dia?	1973 Oct 31.0	81.23	97.25	7004	615	636	0.002	290
	Cosmos 604 rocket	1973-80B	1973 Oct 29.59 60 years	Cylinder 1440	3.8 long 2.6 dia	1973 Oct 30.5	81.21	97.25	7004	583	668	0.005	203

* 1973-79F ejected from 1973-79A about 1973 Nov 8

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
T	Navy Navigation Satellite 20	1973-81A	1973 Oct 30.03 900 years	Octagon + 4 vanes 58?	0.25 long? 0.46 dia?	1973 Oct 30.7	90.18	105.62	7400	895	1149	0.017	327
	Altair rocket	1973-81B	1973 Oct 30.03 600 years	Cylinder 24	1.50 long 0.46 dia	1973 Oct 31.0	90.19	105.59	7399	879	1162	0.019	325
D	Intercosmos 10	1973-82A	1973 Oct 30.79 1340 days 1977 Jul 1	Octagonal Ellipsoid 550?	1.8 long? 1.5 dia?	1973 Oct 31.6	74.03	102.10	7235	260	1454	0.083	120
D	Intercosmos 10 rocket	1973-82B	1973 Oct 30.79 1439 days 1977 Oct 8	Cylinder 2200?	7.4 long 2.4 dia	1973 Oct 31.5	74.03	102.00	7230	258	1446	0.082	120
D	Fragment	1973-82C											
D B R	Cosmos 605 *	1973-83A	1973 Oct 31.77 21.5 days 1973 Nov 22.3	Sphere-cylinder 5900?	5.9 long 2.4 dia	1973 Nov 1.8	62.80	90.66	6686	213	403	0.014	112
D	Cosmos 605 rocket	1973-83B	1973 Oct 31.77 27.75 days 1973 Nov 28.52	Cylinder 2500?	7.5 long 2.6 dia	1973 Nov 1.6	62.78	90.59	6683	213	396	0.014	110
D	Capsule**	1973-83C	1973 Oct 31.77 77 days 1974 Jan 16	Ellipsoid 200?	0.9 long 1.9 dia	1973 Dec 1.0	62.3	90.22	6664	193	379	0.014	-
D	Fragments	1973-83D-F											

* Biological satellite.

** 1973-83C ejected from 1973-83A on 1973 Nov 22.

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 606	1973-84A	1973 Nov 2.54 15 years?	Windmill + 6 vanes? 1250?	4.2 long? 1.6 dia?	1973 Nov 3.6 1973 Dec 1.0	62.91 62.79	709.92 717.51	26361 26550	657 635	39310 39708	0.733 0.736	318 -
D	Cosmos 606 launcher rocket	1973-84B	1973 Nov 2.54 64.88 days 1974 Jan 6.42	Cylinder 2500?	7.5 long 2.6 dia	1973 Nov 3.4	62.79	92.38	6770	218	566	0.026	118
D	Cosmos 606 launcher	1973-84C	1973 Nov 2.54 88 days 1974 Jan 29	Irregular	-	1973 Nov 3.7	62.82	92.90	6796	215	621	0.030	120
	Cosmos 606 rocket	1973-84D	1973 Nov 2.54 15 years?	Cylinder 440	2.0 long 2.0 dia	1973 Dec 2.5	62.75	706.54	26277	654	39144	0.732	318
	NOAA 3 (ITOS)	1973-86A	1973 Nov 6.71 10000 years	Box 306	1.25 long 1.02 square	1973 Nov 7.0	102.08	116.12	7883	1500	1509	0.0006	255
	NOAA 3 second stage*	1973-86B	1973 Nov 6.71	Cylinder 350?	4.9 long 1.43 dia	1973 Nov 8.8	102.06	116.18	7886	1503	1512	0.0006	230
Gd	Fragments	1973-86C-GK											
D	Cosmos 607	1973-87A	1973 Nov 10.53	Sphere- cylinder 6300?	6.5 long? 2.4 dia	1973 Nov 11.5 1973 Nov 17.8	72.83 72.84	89.98 89.70	6651 6637	204 173	341 344	0.010 0.013	66 59
R			11.8 days 1973 Nov 22.3										
D	Cosmos 607 rocket	1973-87B	1973 Nov 10.53 12.76 days 1973 Nov 23.29	Cylinder 2500?	7.5 long 2.6 dia	1973 Nov 10.8	72.82	89.88	6646	204	332	0.010	69
D	Cosmos 607 engine**	1973-87D	1973 Nov 10.53 17.62 days 1973 Nov 28.15	Cone 600? full	1.5 long? 2 dia?	1973 Nov 21.7	72.82	89.56	6630	169	334	0.012	50
D	Fragments	1973-87C, E											

* NOAA 3 second stage disintegrated on 1973 Dec 28.38 near 37 deg South, 178 deg West

** 1973-87D ejected from 1973-87A on 1973 Nov 21.

Space Vehicle: Mariner 10 (1973-85A) and Centaur rocket (1973-85B).

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	[Titan 3D]	1973-88A	1973 Nov 10.84 123 days 1974 Mar 13	Cylinder 13300? full	15 long 3.0 dia	1973 Nov 11.2	96.93	88.85	6595	159	275	0.009	151
D	Titan 3D rocket	1973-88C	1973 Nov 10.84 2.38 days 1973 Nov 13.22	Cylinder 1900	6 long 3.0 dia	1973 Nov 11.0	96.92	88.67	6586	159	257	0.008	150
D	Capsule	1973-88B	1973 Nov 10.84 1872 days 1978 Dec 26	Octagon 60?	0.3 long? 0.9 dia?	1973 Nov 11.9	96.33	94.59	6875	486	508	0.002	60
T	Capsule	1973-88D	1973 Nov 10.84 10000 years	Octagon 60?	0.3 long? 0.9 dia?	1973 Dec 1.0	96.93	114.64	7817	1419	1458	0.002	-
	Fragment	1973-88E											
	Molniya 1AA	1973-89A	1973 Nov 14.86 6 years	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1973 Nov 19.3 1973 Nov 22.7	64.92 64.90	702.37 717.97	26204 26561	454 566	39197 39800	0.740 0.739	285 285
D	Molniya 1AA launcher rocket	1973-89B	1973 Nov 14.86 49.05 days 1974 Jan 2.91	Cylinder 2500?	7.5 long 2.6 dia	1973 Nov 15.6	64.96	91.33	6718	235	445	0.016	68
D	Molniya 1AA launcher	1973-89D	1973 Nov 14.86 72.68 days 1974 Jan 26.54	Irregular	-	1973 Nov 15.9	64.93	91.70	6737	241	476	0.017	70
	Molniya 1AA rocket	1973-89E	1973 Nov 14.86 6 years	Cylinder 440	2.0 long 2.0 dia	1973 Nov 18.3	64.92	698.64	26082	412	38996	0.740	285
D	Fragment	1973-89C											

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Skylab 4*	1973-90A	1973 Nov 16.58	Cone-cylinder	10.36 long	1973 Nov 16.6	50.04	88.22	6567	154	224	0.005	-
3M	[Saturn 208]		84.06 days	13980?	3.91 dia	1973 Nov 17.0	50.04	93.11	6808	422	437	0.001	322
R			1974 Feb 8.64										
D	Skylab 4 rocket	1973-90B	1973 Nov 16.58	Cylinder	18.7 long	1973 Nov 16.8	50.06	88.16	6564	150	222	0.005	44
			<½ day	13600?	6.6 dia								
			1973 Nov 16										
D	Cosmos 608	1973-91A	1973 Nov 20.52	Ellipsoid	1.8 long	1973 Nov 21.2	70.97	92.29	6765	270	503	0.017	81
			231.64 days	400?	1.2 dia								
			1974 Jul 10.16										
D	Cosmos 608 rocket	1973-91B	1973 Nov 20.52	Cylinder	8 long	1973 Nov 21.4	70.97	92.11	6756	274	481	0.015	82
			122.59 days	1500?	1.65 dia								
			1974 Mar 23.11										
D	Cosmos 609	1973-92A	1973 Nov 21.42	Sphere-cylinder	6.5 long?	1973 Nov 22.4	69.95	90.07	6656	241	314	0.006	58
R			12.9 days	6300?	2.4 dia	1973 Nov 22.8	69.94	89.67	6636	174	341	0.013	58
			1973 Dec 4.3										
D	Cosmos 609 rocket	1973-92B	1973 Nov 21.42	Cylinder	7.5 long	1973 Nov 22.5	69.95	89.86	6645	207	327	0.009	40
			12.90 days	2500?	2.6 dia								
			1973 Dec 4.32										
D	Cosmos 609 engine**	1973-92C	1973 Nov 21.42	Cone	1.5 long?	1973 Dec 4.0	69.96	88.94	6599	173	269	0.007	34
			15.14 days	600? full	2 dia?								
			1973 Dec 6.56										
D	Fragment	1973-92D											
	Cosmos 610	1973-93A	1973 Nov 27.01	Cylinder + paddles?	2 long?	1973 Nov 27.4	74.04	95.27	6909	515	546	0.002	4
			7 years	900?	1 dia?								
	Cosmos 610 rocket	1973-93B	1973 Nov 27.01	Cylinder	7.4 long	1973 Dec 1.6	74.04	95.09	6900	500	544	0.003	22
			7 years	2200?	2.4 dia								
D	Fragment	1973-93C											

* Skylab 4 rendezvous with Skylab 1 on 1973 Nov 16.89; docked 1973 Nov 16.92; undocked 1974 Feb 8.44

** 1973-92C ejected from 1973-92A on 1973 Dec 3

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Cosmos 611	1973-94A	1973 Nov 28.42 203.35 days 1974 Jun 19.77	Ellipsoid 400?	1.8 long 1.2 dia	1973 Nov 30.3	70.97	92.06	6754	270	481	0.016	86
D	Cosmos 611 rocket	1973-94B	1973 Nov 28.42 118.31 days 1974 Mar 26.73	Cylinder 1500?	8 long 1.65 dia	1973 Nov 30.6	70.97	91.86	6744	271	460	0.014	88
D	Cosmos 612	1973-95A	1973 Nov 28.49 12.8 days 1973 Dec 11.3	Sphere- cylinder 6300?	6.5 long? 2.4 dia	1973 Nov 28.8 1973 Dec 4.5	72.82 72.84	90.05 89.78	6654 6641	206 187	346 338	0.010 0.011	69 47
R													
D	Cosmos 612 rocket	1973-95B	1973 Nov 28.49 14.17 days 1973 Dec 12.66	Cylinder 2500?	7.5 long 2.6 dia	1973 Nov 28.8	72.84	89.95	6649	205	337	0.010	67
D	Cosmos 612 engine*	1973-95C	1973 Nov 28.49 17.66 days 1973 Dec 16.15	Cone 600? full	1.5 long? 2 dia?	1973 Dec 10.4	72.84	89.16	6610	167	297	0.010	50
D	Fragments	1973-95D,E											
D	Cosmos 613	1973-96A	1973 Nov 30.22 60.1 days 1974 Jan 29.3	Sphere- cylinder + 2 wings 6570?	7.5 long 2.2 dia	1973 Dec 1.1 1973 Dec 8.4	51.60 51.59	89.05 90.99	6609 6704	188 255	273 396	0.006 0.011	85 296
R													
D	Cosmos 613 rocket	1973-96B	1973 Nov 30.22 4.29 days 1973 Dec 4.51	Cylinder 2500?	7.5 long 2.6 dia	1973 Dec 1.1	51.60	88.90	6601	184	262	0.006	86
D	Cosmos 613 orbital module	1973-96C	1973 Nov 30.22 99 days 1974 Mar 9	Spheroid 1200?	2.5 long 2.2 dia	1974 Jan 31.9	51.60	90.49	6679	239	363	0.009	-

* 1973-95C ejected from 1973-95A on 1973 Dec 10

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi-major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Molniya 1AB	1973-97A	1973 Nov 30.55 11½ years	Windmill + 6 vanes 1000?	3.4 long 1.6 dia	1973 Dec 2.6 1974 Feb 1.0	62.89 62.7	740.03 717.71	27102 26555	619 484	40829 39869	0.742 0.742	284 -
D	Molniya 1AB launcher rocket	1973-97B	1973 Nov 30.55 29.92 days 1973 Dec 30.47	Cylinder 2500?	7.5 long 2.6 dia	1973 Dec 1.7	62.80	90.82	6694	216	415	0.015	128
D	Molniya 1AB launcher	1973-97C	1973 Nov 30.55 30.52 days 1973 Dec 31.07	Irregular	-	1973 Dec.1.7	62.80	90.98	6702	207	440	0.017	126
	Molniya 1AB rocket	1973-97D	1973 Nov 30.55 11½ years	Cylinder 440	2.0 long 2.0 dia	1974 Feb 19.2	62.79	734.90	26995	452	40782	0.747	281
	Cosmos 614	1973-98A	1973 Dec 4.63 120 years	Cylinder + paddles? 750?	2 long? 1 dia?	1973 Dec 4.8	74.06	100.66	7167	770	805	0.002	2
	Cosmos 614 rocket	1973-98B	1973 Dec 4.63 100 years	Cylinder 2200?	7.4 long 2.4 dia	1973 Dec 6.2	74.06	100.56	7162	765	803	0.003	356
	Fragment	1973-98C											
D	Cosmos 615	1973-99A	1973 Dec 13.47 734 days 1975 Dec 17	Ellipsoid 400?	1.8 long 1.2 dia	1973 Dec 13.8	71.02	95.70	6930	270	834	0.041	83
D	Cosmos 615 rocket	1973-99B	1973 Dec 13.47 406.98 days 1975 Jan 24.45	Cylinder 1500?	8 long 1.65 dia	1973 Dec 15.3	71.02	95.61	6926	271	824	0.040	83

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	DSCS 3 [Titan 3C]	1973-100A	1973 Dec 14.00 >million years	Cylinder + 2 dishes 565	1.83 long 2.74 dia	1974 Jan 1.0	2.5	1436.3	42169	35790	35791	0	-
T	DSCS 4	1973-100B	1973 Dec 14.00 >million years	Cylinder + 2 dishes 565	1.83 long 2.74 dia	1974 Jan 1.0	2.5	1436.7	42177	35797	35801	0	-
D	Titan 3C second stage	1973-100C	1973 Dec 14.00 3.80 days 1973 Dec 17.80	Cylinder 1900	6 long 3.0 dia	1973 Dec 15.4	28.60	89.79	6641	133	393	0.020	135
	Transtage	1973-100D	1973 Dec 14.00 >million years	Cylinder 1500?	6 long? 3.0 dia	1974 Jan 1.0	2.5	1445.5	42349	35806	36136	0.004	-
D	Explorer 51 (AE-C) *	1973-101A	1973 Dec 16.26 1822 days 1978 Dec 12	16-sided cylinder 659 (490 empty)	1.14 long 1.36 dia	1973 Dec 17.3	68.12	132.50	8609	158	4303	0.241	166
D	Explorer 51 second stage	1973-101B	1973 Dec 16.26 241.38 days 1974 Aug 14.64	Cylinder 600?	5.2 long 2.44 dia	1973 Dec 17.3	68.11	132.43	8607	159	4298	0.240	166
D R	Cosmos 616	1973-102A	1973 Dec 17.50 10.80 days 1973 Dec 28.30	Sphere-cylinder 5900?	5.9 long 2.4 dia	1973 Dec 17.7	72.86	89.90	6647	206	332	0.009	66
D	Cosmos 616 rocket	1973-102B	1973 Dec 17.50 13.67 days 1973 Dec 31.17	Cylinder 2500?	7.5 long 2.6 dia	1973 Dec 18.2	72.88	89.83	6644	204	327	0.009	60
D	Capsule **	1973-102E	1973 Dec 17.50 16 days 1974 Jan 2	Ellipsoid 200?	0.9 long 1.9 dia	1973 Dec 28.4	72.90	89.50	6627	197	301	0.008	-
D	Fragments	1973-102C,D,F											

* Atmospheric Explorer C. Manoeuvrable satellite. The orbit was changed many times.

** 1973-102E ejected from 1973-102A about 1973 Dec 28.

Year of launch 1973 continued

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
D	Soyuz 13	1973-103A	1973 Dec 18.50	Sphere-cylinder +	7.5 long	1973 Dec 18.6	51.57	88.80	6596	188	247	0.004	72
2M			7.87 days	2 wings	2.2 dia	1973 Dec 19.8	51.57	89.22	6617	223	254	0.002	59
R			1973 Dec 26.37	6680?									
D	Soyuz 13 rocket	1973-103B	1973 Dec 18.50 3.60 days 1973 Dec 22.10	Cylinder 2500?	7.5 long 2.6 dia	1973 Dec 19.2	51.57	88.79	6595	187	247	0.004	84
D	Fragment	1973-103C											
	Cosmos 617	1973-104A	1973 Dec 19.40 5000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Dec 26.6	74.03	114.04	7789	1336	1486	0.010	91
	Cosmos 618	1973-104B	1973 Dec 19.40 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Dec 20.7	74.02	115.28	7846	1446	1489	0.003	120
	Cosmos 619	1973-104C	1973 Dec 19.40 9000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Dec 20.4	74.02	115.06	7836	1423	1493	0.004	127
	Cosmos 620	1973-104D	1973 Dec 19.40 10000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Dec 21.0	74.01	115.51	7856	1461	1495	0.002	156
	Cosmos 621	1973-104E	1973 Dec 19.40 8000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Dec 20.7	74.03	114.84	7826	1410	1485	0.005	108
	Cosmos 622	1973-104F	1973 Dec 19.40 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Dec 20.7	74.01	114.44	7807	1371	1487	0.007	105
	Cosmos 623	1973-104G	1973 Dec 19.40 7000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Dec 20.4	74.02	114.63	7816	1389	1487	0.006	106

1973-104 continued on page 354

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Cosmos 624	1973-104H	1973 Dec 19.40 6000 years	Spheroid 40?	1.0 long? 0.8 dia?	1973 Dec 20.7	74.02	114.24	7798	1366	1474	0.008	104
	Cosmos 617 rocket	1973-104J	1973 Dec 19.40 20000 years	Cylinder 2200?	7.4 long 2.4 dia	1973 Dec 20.8	74.03	117.13	7929	1476	1626	0.009	258
D	Cosmos 625	1973-105A	1973 Dec 21.52 12.78 days 1974 Jan 3.30	Sphere-cylinder 6300?	6.5 long? 2.4 dia	1973 Dec 21.9 1973 Dec 27.4	72.83 72.83	89.77 89.80	6641 6642	204 188	321 340	0.009 0.012	70 51
R													
D	Cosmos 625 rocket	1973-105B	1973 Dec 21.52 10.75 days 1974 Jan 1.27	Cylinder 2500?	7.5 long 2.6 dia	1973 Dec 22.3	72.83	89.65	6635	202	311	0.008	68
D	Cosmos 625 engine*	1973-105E	1973 Dec 21.52 15.61 days 1974 Jan 6.13	Cone 600? full	1.5 long? 2 dia?	1973 Dec 30.8	72.81	89.37	6621	166	319	0.012	55
D	Fragments	1973-105C,D											
	Molniya 2H	1973-106A	1973 Dec 25.47 10½ years	Windmill + 6 vanes 1250?	4.2 long? 1.6 dia	1973 Dec 26.5 1974 Feb 1.0	62.89 62.90	736.95 718.01	27027 26562	488 434	40809 39934	0.746 0.744	281 -
D	Molniya 2H launcher	1973-106B	1973 Dec 25.47 30.44 days 1974 Jan 24.91	Irregular	-	1973 Dec 25.9	62.84	90.95	6700	194	450	0.019	121
D	Molniya 2H launcher rocket	1973-106C	1973 Dec 25.47 22.65 days 1974 Jan 17.12	Cylinder 2500?	7.5 long 2.6 dia	1973 Dec 23.4	62.83	90.79	6692	193	435	0.018	122
	Molniya 2H rocket	1973-106D	1973 Dec 25.47 10½ years	Cylinder 440	2.0 long 2.0 dia	1974 Jul 22.9	62.80	733.61	26945	611	40522	0.741	280

* 1973-105E ejected from 1973-105A on 1973 Dec 30

	Name		Launch date, lifetime and descent date	Shape and weight (kg)	Size (m)	Date of orbital determination	Orbital inclination (deg)	Nodal period (min)	Semi major axis (km)	Perigee height (km)	Apogee height (km)	Orbital eccentricity	Argument of perigee (deg)
	Aureole 2	1973-107A	1973 Dec 26.69 30 years	Octagonal ellipsoid 400?	1.8 long? 1.5 dia?	1973 Dec 28.0	74.01	109.16	7566	400	1975	0.184	118
	Aureole 2 rocket	1973-107B	1973 Dec 26.69 20 years	Cylinder 2200?	7.4 long 2.4 dia	1973 Dec 27.2	74.01	109.02	7559	396	1965	0.104	119
	Cosmos 626	1973-108A	1973 Dec 27.85 600 years	Cone-cylinder	6 long? 2 dia?	1973 Dec 29.0 1974 Feb 14.7	65.02 64.91	89.65 104.04	6636 7328	257 910	259 990	0.0001 0.005	321 180
D	Cosmos 626* rocket	1973-108C	1973 Dec 27.85 58 days 1974 Feb 23	Cylinder 1500?	8 long? 2.5 dia?	1974 Feb 11.7	65.02	89.79	6643	234	296	0.005	176
D	Cosmos 626* platform	1973-108D	1973 Dec 27.85 84.63 days 1974 Mar 22.48	Irregular	-	1974 Feb 19.4	65.01	89.43	6625	237	257	0.002	260
D	Fragments	1973-108B, E											
	Cosmos 627	1973-109A	1973 Dec 29.17 1200 years	Cylinder? 700?	1.3 long? 1.9 dia?	1973 Dec 30.6	82.95	105.08	7375	974	1019	0.003	274
	Cosmos 627 rocket	1973-109B	1973 Dec 29.17 600 years	Cylinder 2200?	7.4 long 2.4 dia	1973 Dec 29.5	82.95	104.93	7367	970	1008	0.003	268

* 1973-108C and 1973-108D attached to 1973-108A until orbit change about 1974 Feb 11

INDEX TO REVISED TABLE OF EARTH SATELLITES, VOLUME 2

* These Cosmos satellites ejected a capsule.

* These Cosmos satellites ejected a capsule.

* These Cosmos satellites ejected a capsule.

* These Cosmos satellites ejected a capsule.

* DMSP

REPORT DOCUMENTATION PAGE

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17. Abstract

The RAE Table of satellites at present runs to more than 550 pages, and is divided into three columes. Volume 1, with satellites launched in the years 1957-1968, was issued in revised form early in 1978. Volume 2, covering the years 1969-1973, was originally issued in 1974, and the present revised version incorporates more than a thousand amendments that have accumulated in the past five years. Volume 3 will cover the years 1974-1978, but so far only Parts 1-3 (1974-1976) have been issued.

The present volume lists 559 satellite launches, arranged chronologically. For each launch, the Table gives the name and international designation of each instrumented satellite and its associated rocket(s), with the date of launch, lifetime (actual or estimated), mass, shape, dimensions and at least one set of orbital parameters. Other fragments associated with a launch are listed without these details.

The main Table, which occupies 171 pages, is prefaced by six pages of introduction and explanation, and followed by a seven-page index.

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